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The Appointed Day

CONSIDERING that the record of the meter decides the all-important point of what a consumer shall pay for his "current," the proportion of the top-heavy electricity supply legislation that has been devoted to the subject is small. It seems evident, too, from the relatively few law suits that have arisen out of disputed accounts that the general public has not been dissatisfied with the principles in force for ensuring that meters register only the energy used. In short, the method worked, and supply engineers, threatened from time to time with legislation in other ways, might reasonably have expected to be left alone in this branch of their activities.

The even tenor of the meter man's way was, however, disturbed by an action brought about three years ago by a consumer against East Ham Corporation, the upshot of which was to show that few of the meters installed on consumers' premises were legally "proper" meters.

The traditional way of regarding the certification of meters was not in accordance with the existing Acts, but some less nebulous guide was needed as to future procedure. There was also a need to be mindful lest awkward questions should arise as to the validity of accounts based on readings of the ten million meters or so already installed.

Hence the Act of 1936. This "amnestied" existing meters for the liberal period of ten years (so long as they were not taken out of service), but unless they have been certified, meters supply merely evidence of the energy used and not conclusive evidence. It was also stipulated that after a day "to be appointed" all meters, other than those used under special agreements, should be of a type approved by the Electricity Commissioners (who have already issued appropriate lists) and should be certified as accurate by examiners. The latter take the place of the "electric inspectors," who, in practice, dealt generally with specific instances only.

The Commissioners now propose to recommend to the Minister of Transport that the "appointed day" shall be May 1st, after which, in addition to the obligatory use of certified meters, new requirements for testing will come into force.

Standard or sub-standard instruments are allowed twelve months' grace from the appointed day in which to conform to the requirements of a memorandum issued by the Commissioners last June. After that, in common with all new apparatus of this kind, they will have to be submitted for examination at the National Physical Laboratory in order to see whether they are suitable for retention permanently.

Some latitude is to be allowed to existing testing apparatus which may not comply in all respects with the requirements for new instruments but which may be considered suitable for its purpose for a limited period, such as five years. This flexibility will probably save some expense, as will also, no doubt, the section of the Act that empowers undertakings to make arrangements to carry out testing and repair work for each other.

An opportunity has also been taken of the present changes to modify the regulation concerning permissible limits of error, which are now fixed at 2½ per cent. plus and 3½ per cent. minus at the load at which the meter operates.

While all that the expression "appointed day" implies puts meter certification and testing on a sounder and clearer basis than before, the need for legislation may be regarded possibly as a judgment on supply authorities, too many of whom have not hitherto given metering the serious consideration it has always deserved.

It is to be hoped that the new situation will, among other things, lead to greater appreciation of the value of the meter and testing engineers on the staffs of undertakings. Their duties offer great scope for technical ability and their status should surely be commensurate with what their work means in terms of revenue.

Prolonging the Agony

As we anticipated, the Government's hands are too full to permit it to give immediate attention to the distribution of electricity. Replying to Mr. Chuter Ede on Tuesday, the Prime Minister said that he was not yet in a position to say when the Bill would be presented; he suggested that the question should be put again in a month's time. His answer did not mean that the Government did not expect to pass the Bill this session. In the meantime there is a growing feeling that either something more definite should be said or that the matter should be postponed *sine die*. The numerous small undertakings whose separate existence has been threatened may work all the harder during this period of grace to justify their reprieve, but the suspense may have the opposite effect. This month-to-month shelving of the issue is positively harmful to the industry as a whole, although voluntary amalgamations may be proceeding. The Minister of Transport said that "conversations" with the interested parties are still proceeding. Must we wait yet another month without any guarantee that something more definite will be said then?

Trade Marks

A good deal of mystification exists among manufacturers regarding the registration of trade marks. What marks can be registered? And what protection is afforded by entry in Parts A and B of the Register? These are two questions often asked and until the passage of the new Act last year the answers were not too clear. That Act made a number of points plainer and brought trade-mark legislation more into line with modern conditions. In this issue Mr. W. E. Jackson, a barrister with experience of this branch of the law, explains the principal provisions of the 1937 Act and also deals with the Bill now before the House of Lords which seeks to co-ordinate and clarify the three existing Acts covering the subject.

Preference Shareholders' Position

In view of the present tendency to merge small electricity undertakings into larger groups, the decision of the Oxford Electric Co., Ltd., to sell its business to the Wessex Electricity Co. is of more than local interest. The matter concerns preference shareholders most particularly. For some time past the 6 per cent. preference shares of the Oxford Company have stood in the neighbourhood of 25s., but the holders fear that in the event of the liquidation they would be entitled to no more than the par value. No doubt this would be strict observance of the terms of issue, but it would, nevertheless, be unfortunate for people who acquired the shares at prices above par thinking that their investment possessed some sort of permanence. In such cases the acquiring concern might consider offering stock instead of cash to the preference shareholders to give them something like the same return on their holdings, especially if the ordinary shareholders are receiving a substantial bonus.

The E.R.A.

It is pleasing to note from the seventeenth annual report of the Electrical Research Association, which is reviewed on another page, that there has lately been a substantial increase in membership. This has followed as a direct result of the arrangements made last year for those engaged in the electrical industry who wish to do so to visit the laboratory and acquaint themselves with the nature of the work done. Those municipalities and companies which seem content to remain aloof or contribute only as donors probably suffer from lack of opportunity of direct contact. To believe one has merely to see what is being accomplished. For example, the researches into the properties of steam and the manner in which steel is liable to creep and corrode at elevated temperatures have helped very materially to improve the efficiency of steam power plant. The betterment in generating stations during the past ten years has been of the order of 44 per cent. and has been equivalent to a saving of over £7,000,000, or £700,000 per annum. If the researches are credited with only 10 per cent. of this gain the annual saving alone exceeds the total expenditure of the Association on all its investigations. The practical effect is not merely more reliable plant of greater efficiency, but also a lower cost of generation. Nothing will stimulate consumption and extend applications more rapidly than a reduction of the price charged per kWh, which in turn will benefit all sections of the industry.

A Lightning Code

In the United States about 400 people are killed and 1,000 injured each year by lightning, nine-tenths of the casualties occurring in rural districts. This makes it worth while for the Department of Commerce to draw up a code for the protection of persons and property against lightning and, incidentally, to get together a good deal of technical information on the subject. A revised edition of National Bureau of Standards Handbook H 21 has recently been issued to take the place of its predecessor, published in 1932. An appendix includes an account of the effects of direct and induced strokes on transmission lines. On low-voltage lines most of the flash-overs followed by power arcs are caused by induction, 1,000 to 1,500 kV being frequently recorded in association with steep-fronted surges. The insulation of very-high-voltage lines usually prevents them from suffering in the same way, but up to 4,500 kV has been reached with direct strokes, which usually do the damage. Experience is that one earth wire will lessen the induced voltage by half, two by two-thirds and three by three-quarters, provided the earths are well made, with short conductors at frequent intervals. It is to be gathered that induced charges are regarded more seriously in the States than they are in Great Britain.

Diesel-electric Locomotives

Electric transmission is the only successful means to-day of transmitting power from large Diesel engines to the driving wheels of the locomotive. That, at any rate, is the opinion of Mr. H. L. Andrews, vice-president of the G.E.C. of New York, who has found electricity equal to every step-up in power required for traction and believes that there is no limit to its ability in this respect. A three-unit loco., capable of hauling a 14-car train at 117 m.p.h., has just been put into commission on the Chicago to Los Angeles line making the journey between the towns in 39¾ hours. It is driven by twelve motors for which power is obtained from six 900-h.p. Diesel sets. The "City of Los Angeles" is, we believe, the largest locomotive of its type yet built, but probably of still greater significance is the decision to use electricity as the primary source of heat, lighting and air conditioning. For this two 300-kW Diesel alternators, which run in parallel on the load, are installed in a tender. The installed capacity for auxiliary purposes is thus about one-sixth of that required for propulsion—an appreciable addition to the purely traction load.

London Associated

During the past two or three years the West London public has become familiar with the term "London Associated Electricity" as the slightly abbreviated form of the name of the six-company merger. But the L.A.E.U. is merely a holding and managing company; its constituents have continued as operating companies and dealt with their own consumers. Now the Charing Cross Company, under its new title, Central London Electricity, Ltd., has become the sole operating unit, having taken over the assets, liabilities and rights of its five partners. We think that as a substantial goodwill has been built up by London Associated Electricity on account of its improved tariff policy and other activities, it would be unwise to replace the name suddenly by something else, and this appears to be the view held by those responsible, for no decision to make a change has yet been made.

Large Works Conversion Scheme

General modernisation at an automobile and aero engine factory

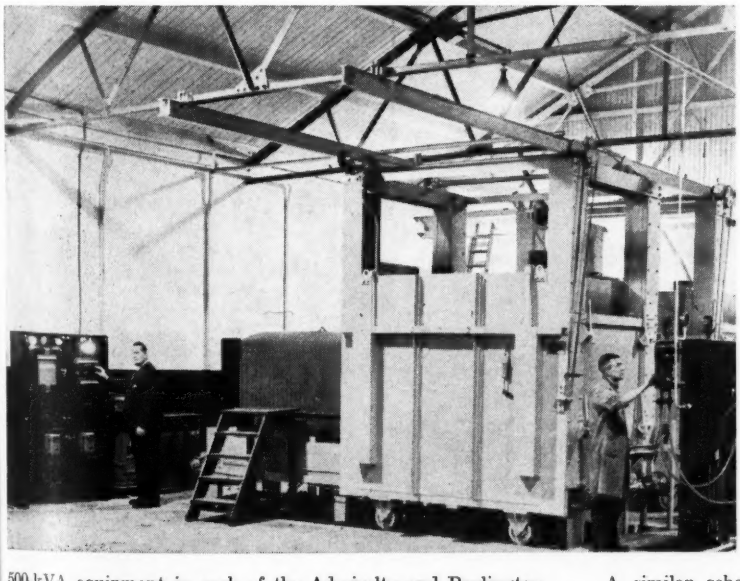
A RECENT visit to the Coventry automobile and aero engine factory of Armstrong-Siddeley Motors, Ltd., revealed not only well-advanced schemes for the change-over of supply to and distribution within the works, but also many interesting things relating to the modernisation of the general factory equipment which the company has undertaken in conjunction with the change-over. The older supply system which is now being superseded is 2,000 V, two-phase, and the several sub-stations on this system about the works have already been relieved of their loads by the new sub-stations which have been erected for distribution from the new supply system at 6.6 kV, three-phase.

Burlington car assembly shop at night

The factory may be considered in two main sections, the aero engine testing shop and the machine shops, and a feeder from the Coventry Corporation 6.6-kV system has been laid to the main sub-station in each section. The inter-connector between these main sub-stations forms a ring main on the Corporation supply to the works. Two other sub-stations (laboratory and No. 4 Machine Shop) are fed from the machine shop section main sub-station (No. 5 Machine Shop), and one other sub-station (Body Shop) is fed from the main aero engine testing shop "sub."

Distribution at 6.6 kV is effected throughout by Crompton Parkinson truck-type 600-A, 250,000-kVA rupturing capacity switchgear, so as to keep the "subs." as uniform as possible and thereby assist in interchangeability and facilitate linking up of additional feeders. The number of units in each sub-station switchboard varies according to the number of outgoing feeders; for instance, while in the Admiralty sub-station there is a seven-panel board accommodating one incoming, four outgoing, one metering and one interlinking units, in the laboratory sub-station there is a single unit connecting the incoming feeder and the transformer.

The total transformer capacity in the new system is 3,000 kVA, a 1,000-kVA transformer being installed in each of the laboratory and No. 4 Machine Shop sub-stations, and a 500-kVA equipment in each of the Admiralty and Burlington sub-stations. All these transformers are of the B.E.T. oil-immersed indoor type, with a voltage range of 6.6 kV to 400/230 V. In addition, there are in the aero engine testing sub-station two 6.6-kV/2-kV transformers in a Scott-connected bank for supplying motors and auxiliary equipment designed for the older system. The 2,000-V supply is controlled by Ferguson Pailin truck units feeding a 150-kVA, 2,200/200-V, two-phase Metropolitan-Vickers transformer.



The low-voltage distribution from the sub-stations is by way of "Klad" Form A drop-head isolation type 400-A switches, each with a straight-through neutral link, the number of units in each "sub." varying according to the number of outgoing feeders. From each "Klad" switch in the sub-stations a 400-A feeder of paper-insulated, lead-covered and armoured cable secured to the girders is run to an eight-way, 100-A ironclad main fuseboard supplied by either the General Electric Co., Ltd., or Bill Switchgear, Ltd. From the main fuseboard feeds on to 20-A, 10-way ironclad fuseboards with high-rupturing capacity fuses are effected by v.i.r. cable in 2-in. screwed conduit. From these high-rupturing fuses, v.i.r. cable in conduit supplies the various machine tools, each machine being separately fused at the 20-A boards. Most of the machines are individually controlled by Crabtree push-button oil circuit-breakers equipped with high-rupturing capacity fuses.

As each new three-phase motor is installed it is automatically served by new wiring. The majority of the new machines in the shops have individual drives, of which there are some thousands of excellent examples. Two-thirds of the large tool room has already been converted to three-phase individual drives, we were told, and so has, say, 20 per cent. of the Middle Machine Shop, 20 per cent. of the Top Machine Shop and all machines in No. 4 Shop. In this department we saw imposing lines of Herbert "Type C" drills, each surmounted with a direct-driving vertical-spindle motor and with similar driving arrangements there are some particularly interesting grinding machines for the accurate production of round holes in crank-bearing housings. The spindle speed is 12,500 r.p.m., and the table revolves in the opposite direction at 60 r.p.m. The vertical motor speed is 1,400 r.p.m. and drives *via* speed-increasing belts with a one-to-three ratio.

Nitriding furnaces: photograph taken by gas-discharge lighting

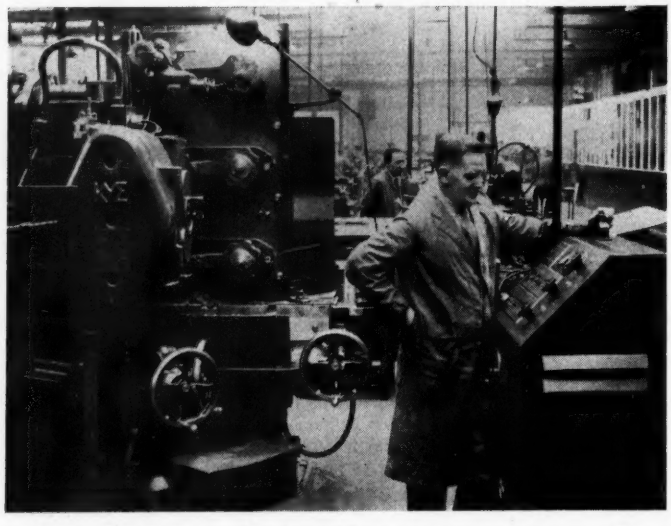
The machine-drill spindles and the table spindles have so accurate a fit in the bearing that when cold it is impossible for them to turn. Therefore, in the housing of each spindle is incorporated an element which imparts before starting a greater expansion to the housing and allows the spindle to turn. The element for either spindle is loaded at about 1,000 W. The element, which is contained in an oil jacket, is put into circuit just before the start and is used at the time of starting up only.

A similar scheme for expanding the bearing housing is incorporated in internal cylinder-grinding machines. In these cases, however, the oil is heated externally and pumped into the bearing housing. The spindle speed is from 4,000/5,000 r.p.m. This process has been patented by the company.

Probably the most outstanding example in the machine tool equipment is a Keller automatic milling machine, which has a generator in the machine body supplying at 110 V the power for the five machine motors, *viz.*, lubricant pump, cutters, horizontal table movement, vertical table movement, and transverse table movement. Each movement motor drive incorporates a clutch and the whole control is effected by contact points which make and break under the influence of

the tracer. In the control cabinet there is another generator, which supplies at 12 V. This serves just the tracer, in which are the contact points referred to. These are operated according to the direction of the travel of the tracer, and the contacts successively operate relays in the cabinet, which, again in turn, operate the 110-V motors.

For supplying a good many of the high-speed machine tool motors there are installed a couple of B.T.H. 50-cycle to 180-cycle 12.5-kVA frequency changers. For supplying the d.c. car engine testing stands there is a motor-generator set



The Keller profiling machine

with a 280-h.p. auto-synchronous motor directly coupled to a 440-V, 190-kW generator. The auto-synchronous motor also serves as well for power-factor correction.

There are six of the automobile engine testing sets, and each is driven by a 55-h.p. motor which runs up to 3,500 r.p.m. Indications by light signals are given of the following operations: motoring, generating, ready for generating, passed for power, and maximum b.h.p. at low r.p.m. This sequence of operations is effected entirely automatically, the only manual control being " stop " and " start."

Some of the most interesting equipment we saw was that in a new nitriding department where, so as to permit hardening without upsetting the physical properties and to give a nitrogen-hardened depth of 15/20 thousandths, two " Birlec " furnaces have been installed. Each furnace is supplied at 400 V, three-phase, is loaded at 55 kW, and has a temperature range of 0/620 deg. C. The material for treatment is put into a container, over which a cover is lowered and sealed in a trough surrounding the container at the bottom. Ammonia is pumped into the container and is distributed over the whole area of the contents by a fan beneath the container.

The container on its table is stationary, the body of the furnace being pushed over it. The furnace is mounted on rollers and can be readily pushed by hand. The complete soaking period is 22 hours, 10 hours being devoted to raising the temperature and 12 hours to cooling. The treated material cannot be exposed to the atmosphere until the temperature has fallen to 150 deg. C.

In connection with the nitriding plant, some new nickel-plating and tinning vats by W. Canning & Co. have been installed. Spot welding for the assembly of the car bodies is receiving greatly increased attention, and the latest idea, as we saw it in these works, is mounting the welding equipment on a girder structure under which the car bodies are rested during the welding treatment. Single-phase a.c. welding is employed, and on each girder structure there is a 400-V (phase-to-phase) 50-cycle " Sciaky " equipment. The electrode gripping arms are water-jacketed and cooled by a continuous flow of water.

For driving the fans for assisted air tests, *i.e.*, assisting the propeller to supply air to the engine, and also for the power brake tests, *i.e.*, actually loading the engine, 6.6-kV motors are installed. They are slip-ring machines of 200-h.p. capacity in the case of air testing and 600 h.p. for the brake testing. The motors are directly coupled and are of the double end shield type, fitted with ball and roller bearings. The rotor control is by Allen West water-resistance starters and oil-immersed resistance starters of Ellison manufacture. The motors are of the Crompton " MM " range. The stator of each motor is served by a 6.6-kV truck feeder similar to those employed in the sub-stations.

Two new equipments recently installed for running in aero engines have variable speeds from 600/2,100 r.p.m. They are driven by d.c. 400/2,000 r.p.m. motors, each supplied from a 17.5-kVA motor-generator set which affords Ward Leonard control of the driving motor. A supercharger running-in stand just installed has a 240-h.p., 450-r.p.m., three-phase, 6.6-kV motor which is served by a truck switch unit similar to those described, the rotor being controlled by an Allen West liquid starter with screw operation. We saw also three crankshaft running-in stands each driven by a 10-h.p. " Tork " 400-V, 920-r.p.m. motor served by an Ellison oil circuit-breaker strapped to the motor bed.

There are many excellent examples of industrial lighting throughout the factory, and with the exception of the more recently instituted workshops, the whole scheme is by Benjamin projectors. In the car body assembly shop, for instance, 300-W projectors of this make are spaced at 12 ft. either way at a height from floor level of 13 ft., and the result is 10 candles at the working plane. The nitriding shop is a typical example of the more recently established departments referred to, and here are installed " Osira " lamps.

United States Electrical Trends

DESPITE the business recession towards the end of last year the United States electrical industry's record for the complete year is one of expansion in nearly all sections. Writing in the *Electrical World*, Mr. C. W. Kellogg, president of the Edison Electric Institute, discusses the electrical utility situation, with figures for 1937 based on ten months actual and two months estimated.

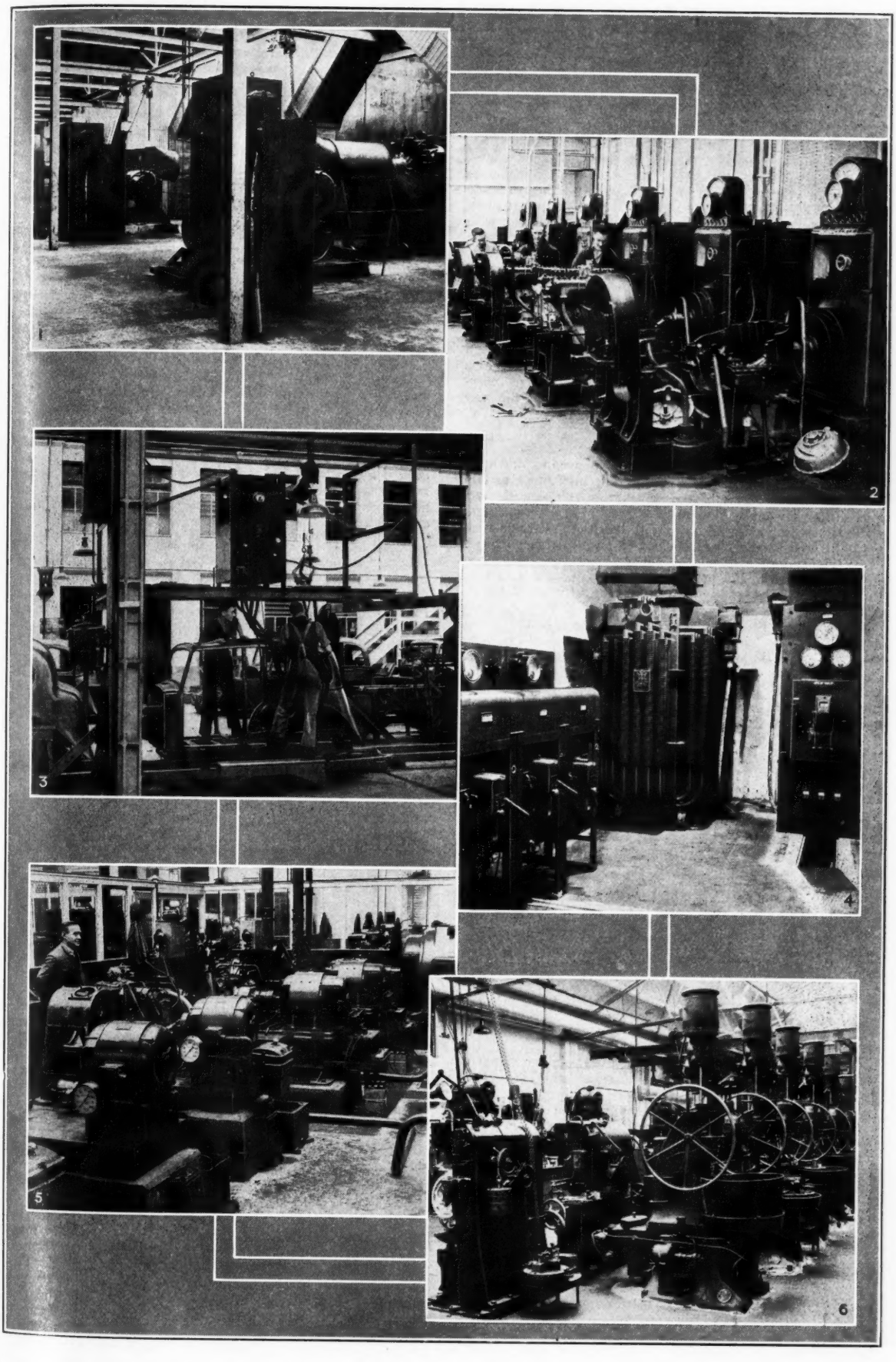
Output, at 119,000 million kWh, represented a gain of 8¼ per cent. over the previous year, the sources of this energy being divided about as in former years—58 per cent. fuel, 38 per cent. water-power and 4 per cent. purchased, &c. Energy sales increased by 10 per cent. to 99,300 million kWh, the percentage expansion in the chief groups being as follows: Farm supplies (24), commercial (18), residential (13) and industrial (8).

At the end of the year generating capacity (27¼ per cent. hydro-electric) was approximately 35,042,000 kW, a net gain of 782,000 kW. Total construction expenditures (exclusive of federal work) were about $455,500,000, compared with about $290,000,000 in the previous year. Construction expenditures in 1937 were, however, less than half what they were in the peak year of 1930. As has been the case for many years, only 27 per cent. of construction costs were for generating capacity, the remainder representing facilities for distributing energy from the generating station to the consumers' premises.

The total number of consumers at the end of the year was about 27,000,000, an increase of 794,000. Of these 22,440,000, or 83 per cent., of the total consumers are residences (including farms). The average residential use of electricity was 797 kWh in 1937, compared with 727 kWh in 1936, and the average price at the end of the year was 4.37 cents, compared with 4.65 cents at the end of 1936. These figures do not include farms; their inclusion makes a combined average for 1937 of 806 kWh and 4.38 cents respectively.

Getting electricity to the farms has been the object of special effort and study by the electrical utility industry for more than fifteen years. From the start the difficulties connected with this effort have been those inevitably following from the high cost of distribution lines per farm where settlement was sparse and from the relatively low purchasing power of the majority of farmers. These difficulties have, however, acted as a spur to continued effort to solve them and further notable progress was made during 1937. The number of farms now electrified is about 1,200,000, of which about 157,000 were added during the past year. In addition, it is estimated that about 280,000 farms can be reached by existing farm lines. This makes electricity available to about 1,480,000 farms, a number equal to about 35 per cent. of all the farms in the country having dwellings valued at $500 or over. As indicating the continued activity of the utilities in farm electrification, it is worth noting that more than 85 per cent. of the new farms connected in 1937 were to the lines of private companies.

In the sale of electrical appliances also 1937 was a record year. Refrigerator sales numbered 2,400,000 (2,080,000 in 1936); range sales 415,000 (320,000); and water heater sales 110,000 (92,000).



Views of the Armstrong-Siddeley Works (See preceding pages)

1. Assisted-air testing equipments; 200-h.p., 6,600-V motors. 2. Car engine test stands (dynamotors). 3. Spot-welding an automobile body. 4. "Klad" switchgear, transformer and h.v. truck unit in No. 4 machine shop sub-station. 5. Unit running-in stands. 6. Battery of internal grinding machines

Trade Mark Legislation

By W. Eric Jackson, LL.B., Barrister-at-Law

The 1937 Act brought trade-mark law up-to-date. A new Bill clarifies and consolidates the law

A new codifying measure

THE Trade Marks Bill which has recently been introduced into the House of Lords provides another example of the present-day tendency towards the codification of the laws of this country. The codification in the present instance does not cover a very wide field; for legislation relating to trade marks is a specialised branch of law and at the moment there are only three Acts of Parliament specially concerned with the subject, namely, the Trade Marks Act, 1905, the Trade Marks Act, 1919, and the Trade Marks (Amendment) Act, 1937. The present Bill seeks, without amending the law, to substitute for those three Acts one general consolidating Act. That such a consolidating Act is desirable will be realised from the fact that the Act of 1937 contained so many amendments of the previous Acts, that it was comparable in length with those two Acts put together. Anyone who has tried to solve a legal problem by reference to Acts which amend other Acts will realise what a desirable convenience it is to have everything tidied up into one statute. The producers of the new Bill are therefore to be complimented on their work.

The 1937 Act

The Act of 1937, which, as explained above, is the main cause for promoting a consolidating Bill, introduced certain features arising out of the development of commercial practice. Infringement was more closely defined; assignment of trade marks was more adequately dealt with; provisions were made to prevent the deceptive use of trade marks on goods other than those for which the marks were registered; certification trade marks (*i.e.*, commercial marks of the nature of hall marks), joint trade marks, and registered users and their rights were dealt with.

All these and other amendments being incorporated in the new Bill go to make it a complete and comprehensive measure of guidance, protection and assistance to users of trade marks. Not that the Bill is easy to read—quite the reverse—for it has been drafted for experts by experts. If the Bill is difficult to read the lawyers are not to blame; draughtsmen of Bills have one aim in view—not to make litigation, but to avoid it.

The Two Classes

The Bill provides for the continuance of the Trade Marks Register in Parts A and B, each part conferring its due measure of protection. Registration in Part A confers exclusive rights to the use of the mark. These rights are infringed if the mark is used by any other person without permission, as a trade mark or as an advertisement, or in any way giving the impression that that person had a right to use it.

Certain cases which might have given rise to a technical infringement are allowed for, *e.g.*, where a seller delivers goods properly marked with his trade mark, and the buyer resells the goods with the trade mark still on them; or, where trade-marked articles are made up with, or made out of, non-trade-marked goods; in these cases the use of the trade mark on the resold articles, or on the made-up article, will not be an infringement, even though the seller, in the one case, was not owner of the mark, or, in the other case, the completed article was partly composed of materials not covered by the trade mark.

Registration in Part B confers somewhat similar rights as registration in Part A; but whereas registration in Part A confers an absolute right to proceed against infringers, registration in Part B gives, in effect, a right to proceed only against infringers whose infringements cause deception or confusion. Moreover, registration under Part A cannot be attacked after seven years, except on the grounds of fraud or deception; whereas under Part B there is no time limit within which applications can be made for the rectification and correction of the Register.

Whether a mark is to go in Part A or Part B of the register depends on the nature of the mark. Part A marks must be "distinctive," *e.g.*, a sign, badge, signature, or an invented word. Part B marks must be merely capable to distinguishing one person's goods from another's, *e.g.*, an uninvented phrase, such as "Fish brand" (without any design or device).

The Bill contains provisions prohibiting the registration of similar or identical marks and deceptive matter, but expressly preserves the right of a person to use his own name or place of business or bona fide words of description, even though these may clash with a registered trade mark.

Section 6 of the Bill allows the making of protective agreements between owners of trade marks and purchasers of their goods. These provisions are designed to prevent purchasers from altering or adding to the trade mark on a resale of the goods, any breach of the provisions being treated as an infringement to which there will be no defence.

An important provision is that in Section 15, and is illustrative of the way in which the legislation has been brought into line with modern conditions. Modern progress in manufacture has brought into existence many new products for which no common name exists other than the "patent" or "trade mark" name. To concoct an example readily understandable is not difficult. Mr. Gillette invents a new type of razor blade, and registers his signature as the trade mark. The only reasonable way of describing the new article is "a Gillette razor blade." The name comes into common use, and, when his patent expires, other manufacturers use the newly coined phrase "Gillette pattern" to describe their wares. Is the use of this phrase an infringement of the original trade mark? The answer is "No!" But the answer might not always be the same; for the section provides that, even if a new word has come into common use, that use will not excuse an infringement (except in certain cases) if the new word is part of a trade mark. The section allows, *inter alia*, for rectification of the Register in such cases.

Assignment of Marks

Important provisions are contained in the Bill for the assignment of trade marks (Sections 22 to 25). The assignment must be registered, and must not cause confusion or interference with the rights of other persons in the trade mark. While the Bill also provides for the disposal of trade marks which have not been used (Section 26) it also contains provisions (Section 27) to allow a person to register a mark used in relation to certain goods, but which he does not intend to use in relation to certain other goods. For example, Messrs. Bass & Co. are owners of the famous red triangle in relation to their beers. They could also register the red triangle in relation to whisky (even though they may not intend to make whisky). This "defensive registration" will prevent anyone selling whisky under the red triangle and giving the impression thereby that Bass & Co. are the makers of it.

Section 28 deals with registered users, and provides means whereby the owner of a trade mark may grant a permit or concession to another trader to use the mark. The convenience of this to sub-contractors, agents and persons manufacturing under licence is obvious. The person permitted to use the trade mark is registered with the Registrar of Trade Marks, and has the right to take proceedings himself for infringements. Although non-user is a ground for removing a trade mark from the register (or even for refusing registration) a mark may (Section 29) be none the less registered if the person registering it intends not to use it himself, but forthwith to assign the mark to a company in process of formation, or to confer its use on a registered user.

Section 37 deals with certification trade marks, *i.e.*, marks used not by manufacturers and traders, but by persons whose business it is to certify goods as being of certain quality, make, etc. Marks used by assayers, hall marks and other such marks are the kind of thing covered by the section. These marks are registrable in Part A and are protected by similar provisions as to infringement.

Trade marks are to be registered for seven years in the first instance (Section 20), renewable for subsequent periods of fourteen years each. Under Section 31 the use of a trade mark on goods exported is deemed to be a use of the mark for the purposes of the law. Infringements committed by sending goods abroad under a false mark will therefore be punishable.

The Bill contains necessary administrative powers for the Board of Trade (to deal with certain appeals and to make regulations) and for the Registrar (to deal with the formalities of registration). It is interesting to note that, under Section 42, the Registrar is empowered to give advice to persons intending to apply for registration, as to whether the proposed mark complies with requirements as to distinctiveness.

Penalties, as may be expected, are prescribed for, among other matters, falsely representing a trade mark as registered when it is not, for causing false entries in the Register, and for using the Royal Arms without permission (Sections 59-61).

The new Act is intended to come into force on the day after the Act of 1937 is appointed to come into force, *i.e.*, a day to be appointed by the Board of Trade.

Electricity Costs.

By J. F. Elphick, A.M.I.E.E.

The influences of efficiency and load factor

APART from the gain arising from the effects of interconnection under the Electricity Supply Acts, there are two main directions in which an established undertaking must look for a means of reducing the cost of producing and supplying electrical energy: (1) Overall commercial efficiency of production, and (2) load factor. An undertaking's total costs may be separated into standing and running components. The former may be considered as expenses incurred to meet the demand for power (kW) and in general, therefore, remains fixed for a given demand. The latter is composed of the increment due to the consumption of energy (kWh). The running costs actually consist of a proportion only of the expenditure on (1) fuel, (2) oil, water and stores, (3) salaries and wages, and (4) repairs and maintenance.

The author's examination of the position reveals an immense scope for reduction in costs by load factor improvement

Of these costs by far the largest is that of fuel. Being also an item of expense most responsive to control, it follows that the efficiency of the process which it represents assumes considerable significance when the question of reduced costs is under consideration. That load factor has an important bearing upon costs is well known, but it seems doubtful if the magnitude of its influence is fully realised.

To compare the merits of these two factors an attempt has been made to determine, on broad lines, what the cash equivalent of any variation amounts to in the case of a fairly large undertaking. It is evident that for this purpose a schedule of basic costs and other relevant data is necessary (table 1). This matter is based upon information collected from several sources, including the published figures of an authority of the size mentioned, situated in an industrial area. It is not put forward in any way as an example, but it is considered sufficiently representative for the present purpose. Obviously, a similar investigation along parallel lines could be made for any other set of conditions, if desired.

Efficiency

Considering, first, the financial gain which may be effected by raising the efficiency, it is clear that when the improvement is wholly due to operating methods the saving may be fully realised; when, however, this is achieved by replacement of old by more efficient plant, or by the installation of additional equipment, &c., the capital charges involved must be deducted in order to arrive at the net gain. Fig. 1, which is based upon the assumption that no extra expense is incurred, shows the relation between efficiency and average cost per kWh, and also the annual gain due to any improvement over the basic efficiency of 20 per cent. It must be pointed out here that it is assumed that fuel costs are a function of thermal efficiency, thus presupposing that the plant is operated under optimum conditions in respect of price and grade of fuel. Incidentally, this aspect has been discussed by T. G. Simpson in an article on "Efficient Generation" (ELECTRICAL REVIEW, January 26th, 1934), in which it was demonstrated in a practical manner that commercial efficiency is not necessarily synonymous with thermal efficiency. The best conditions must be determined according to the peculiarities of the particular plant under consideration.

It will be observed that the saving, even with an efficiency nearing the maximum so far attained, although substantial, is by no means startling, and its effect upon the average cost per kWh is comparatively small. An examination of table 1 reveals the reason. It shows that even the whole of the fuel costs amount to only about 12 per cent. of the total expenditure, and one is forced to the conclusion that any really large reduction in costs cannot be expected from this source, under present methods of power generation. Indeed, although this is a question really outside the scope of the present article, fuel costs have now become such a small part of the total that one cannot fail to speculate as to whether the adoption of some other method of production, whereby the inherent limitations of the steam cycle are eliminated, unless accompanied by reduced capital costs on other advantages, could contribute materially towards the "cheap and abundant" supply which is held to be the chief aim of the industry.

Load Factor

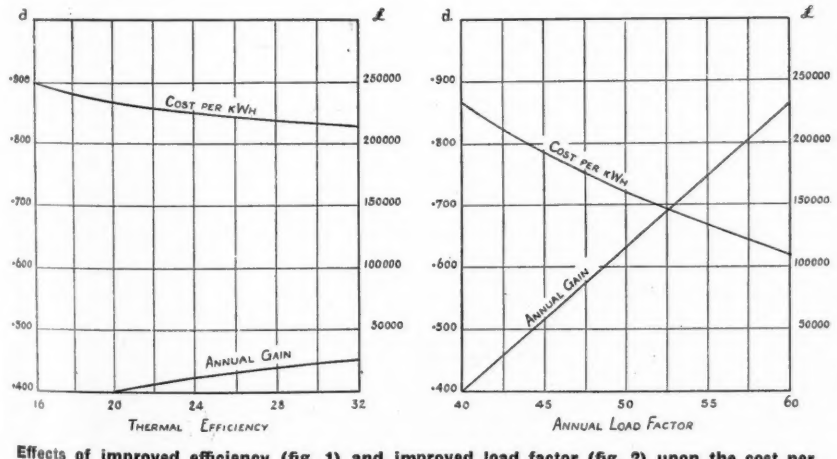
Turning now to the influence of load factor, the left hand side of table 2 shows an analysis of the basic costs corresponding to a load factor of 40 per cent., and in the second half appear the estimated figures for a load factor of 60 per cent. At this point it may perhaps be helpful to explain the means whereby the estimated costs have been calculated. The Electricity Commissioners have issued formulæ for the allocation of production costs into fixed and running components, these forming the basis of transactions between the C.E.B. and an undertaking which repurchases its supplies under this method. Since the only variable in these formulæ is l.f., it follows that by determining the fixed costs, in terms of the total cost, for any two load factors and then equating, the total cost corresponding to the higher l.f. can be expressed in terms of the cost appertaining to the lower l.f. By such means the estimated costs appearing in table 2 have been calculated.

TABLE 1.—BASIC COSTS AND DATA.

Installed capacity	60,000 kw
Maximum demand	50,000 kw
Total capital cost at £52 per kw	£3,120,000
Capital charges 8%	£250,000
Coal 11s. per ton ... Cal. value	11,000 B.Th.U./lb.
Thermal efficiency	20.0%
Annual load factor	40.0%

Item.	% of Total cost.	Annual cost.	Cost per kWh sold.
Generation and distribution:		£	d.
Fuel	12.3	66,400	0.107
Oil, water and stores	0.2	1,200	0.002
Salaries and wages	8.4	45,100	0.073
Repairs and maintenance	11.5	62,000	0.100
Rents, rates and taxes	8.6	46,100	0.074
Management	12.5	67,100	0.108
Capital charges	46.5	250,000	0.403
Total cost	100.0	£537,900	0.867

With regard to distribution costs, additional factors intrude, and, in consequence, there is some diversity of opinion upon the question of the control exercised by load factor in practice. However, in this examination, these have been included with the generation costs, and are, therefore, resolved in a similar manner. In effect, the method adopted assumes that the relationship between total costs and output follows a straight line law, in which case it provides a means of determining the constants. These having been derived, it is possible to calculate the average cost per kWh at any load factor (fig. 2). On the same graph is also shown the annual gain due to any increase in load factor above the datum of 40 per cent. For ease of comparison the ordinates in fig. 2 are to the same scale as in fig. 1.



Effects of improved efficiency (fig. 1) and improved load factor (fig. 2) upon the cost per kWh, showing the annual gain

The results indicate the enormous gain which may be achieved by this means. For example, in the present case, an increase of 20 per cent. in the load factor reduces the average cost per kWh sold from 0.867d. to 0.620d., being equivalent to an annual gain of approximately £230,000. The cash value of even a modest 1 per cent. exceeds £11,000 annually. The reason, of course, lies in the fact that, of the total cost of producing and distributing electricity, by far the greater proportion is a fixed cost, which does not vary with output. But if the output be increased, the share to be contributed by each kWh must be reduced.

Summing up, it has been shown that while some gain is to be expected by attention to efficiency of production the cash equivalent of load factor is immense. Examination shows that an increase of approximately 2 per cent. in load factor is equivalent to any saving which could be effected by improved production efficiency. This does not imply either criticism of the search for efficiency or disparagement of the engineering side. Clearly skill in design and operation is essential to progress.

At the same time, however, if the case examined can be considered as representative, it is evident that as an instrument for the reduction of costs the sales branch is of supreme importance.

TABLE 2.—ANALYSIS OF COSTS AT VARYING LOAD FACTORS.

Item of Expense.	ANNUAL COSTS.									
	40% Load Factor.					60% Load Factor.				
	% Division.		Total.	Standing.	Running.	% Division.		Total.	Standing.	Running.
	Fixed.	Running.				Fixed.	Running.			
Generation and distribution:			£	£	£			£	£	£
Fuel	16.34	83.66	66,400	10,850	55,550	11.52	88.48	94,160	10,850	83,310
Oil, water and stores ...	20.57	79.43	1,200	250	950	14.71	85.29	1,680	250	1,430
Salaries and wages ...	86.81	13.19	45,100	39,150	5,950	81.43	18.57	48,080	39,150	8,930
Repairs and maintenance...	74.07	25.93	62,000	45,920	16,080	65.53	34.47	70,070	45,920	24,150
Rents, rates and taxes ...	100	—	46,100	46,100	—	100	—	46,100	46,100	—
Management	100	—	67,100	67,100	—	100	—	67,100	67,100	—
Capital charges	100	—	250,000	250,000	—	100	—	250,000	250,000	—
Totals	—	—	£537,900	£459,370	£78,530	—	—	£577,190	£459,370	£117,820
Total cost per kWh sold			0.867d.					0.620d.		

Electric Drive for Small Excavators. By W. A. Barson

THE advantages of electric power for excavating with the bigger sizes of shovels and draglines in open cast mines, quarries, claypits, &c., has been exploited for many years, but the smaller machines are nearly always Diesel or petrol paraffin engine driven. It is argued that the supply cable of an electric machine hampers its movements and therefore it has not the freedom of travel of a Diesel-engined machine. This is quite true of machines which have to be taken from job to job by a contractor, but many excavators spend their whole lives in one mine, quarry, clay pit, or gravel pit, where a properly arranged trailing cable need be no hindrance if the excavator is within easy reach of a power line. Indeed, many undertakings may run all their handling and processing plant electrically and yet fail to run a power line into the pit or quarry for the excavators.

The reason for this is often the purchasers' lack of appreciation of the relative advantages of electric and Diesel-driven excavators, which leads him to choose the Diesel machine because it is complete in itself. The general attitude of excavator manufacturers supports this easy installation policy, as they hesitate to push the electric machine which may necessitate additional capital outlay on a power line and plug boxes. Thus the much exaggerated disadvantages and dangers of trailing cables are permitted to loom large, while the true comparison, which must include running cost, output and maintenance as well as initial cost, is overshadowed.

First Cost

Initial cost is given far too big a share in the considerations, but in this respect the electric excavator shows up to advantage, as it may cost 10 or 15 per cent. less than the equivalent Diesel-engined machine. However, this may be more than swallowed up by the cost of running a power line into the quarry, or pit, while allowance must be made for progression of the plugging point as the machine works along, or into, the cut. If a long trailing cable is used a drum may be necessary to take up the slack cable as the machine travels; this may be cheaper in some places than a multiplicity, or frequent moving, of plug boxes. The usual method is to let the trailing cable "snake" along the ground and protect it near the machine with movable pipes or troughs.

The outputs of similar machines will vary between a maximum in loose earth and a minimum of only one-third or even less in blasted rock or heavy clay and boulders. Thus the power consumption per unit excavated must be determined separately for each particular job.

With the smallest sizes of excavators working under favourable conditions the power per unit excavated may be lower than for bigger machines, as the material is handled through a shorter distance. On machines of ½ to about 1½ cu. yd. bucket capacity the consumption per unit excavated appears to be fairly constant for Diesel fuel oil from 0.02 to 0.07 gallons and for electric power from 0.3 to 0.8 kWh per cubic yard excavated. The peak load of electric excavators is approximately 80 kW per cubic yard of bucket capacity.

From the maintenance point of view the comparison is strongly in favour of the electrical excavator as against the Diesel machine as the even torque of the motor is less harsh on the clutches, gears, bearings, ropes, &c., than the cyclic irregularities of an engine.

Other items of Diesel engine maintenance that have no counterparts in an electrical machine include replenishing and frequent draining and refilling with crankcase lubricating oil, regular cleaning of strainers, maintaining cooling water level and regular overhauling of the engine. Further, on all but the smallest machines the main engine is started either by a small petrol engine, which turns the main engine over under no compression, or by compressed air, when a petrol-engined compressor set is fitted. This is another item which requires fuelling, oiling and maintaining in good working order. The delivery and storing of fuel and lubricating oils need proper consideration, as does also the cooling water supply for the engine radiator.

An electrical machine is ready for work in a few seconds, whereas starting Diesel engines is not nearly so easy as although very real improvements have been made in recent years they are sometimes very sulky on a cold morning. In frosty weather it is often necessary to drain the water from the radiator each night, so that the extra job of filling up with water in the morning must be allowed for. All this occurs every day and may amount to hundreds of cubic yards difference in output during the course of a single year's working.

The simplicity of the electrical equipment of a small excavator will be seen from the following items of specification, which are typical. The motor is a continuously rated, non-reversing, squirrel-cage machine with ordinary ventilated or drip-proof protection. A hand-operated star-delta starter, with no-volt release and overload relays with time lags, is fitted in any convenient position in the cab. The starter is arranged for air break on the smaller machines, while an oil-immersed starter is sometimes fitted on the larger sizes. An emergency push-button stop switch is placed near the driver. A main switch is fitted for isolating the motor and starter gear.

The trailing cable, which has an earthing lead, is taken to the excavator base frame and connected through a plug and socket to slipring collector gear and thence to the main switch, starter and motor, which are on the revolving superstructure.

Copper and Ferrous Castings

A new publication by the Copper Development Association is a book of 136 pages and 61 figures entitled "Copper in Cast Steel and Iron." This is No. 29 in a series of books relating to different applications of copper and iron alloys, which are obtainable free of charge from the Association. The volume contains a wealth of technical data of the kind that is required by foundrymen, metallurgists and engineers, and summarises the results of recent research, giving an indication of possible future developments and widening of scope for copper additions in casting. Many of the illustrations consist of excellent photographs of microstructures and a bibliography of the subject is included.

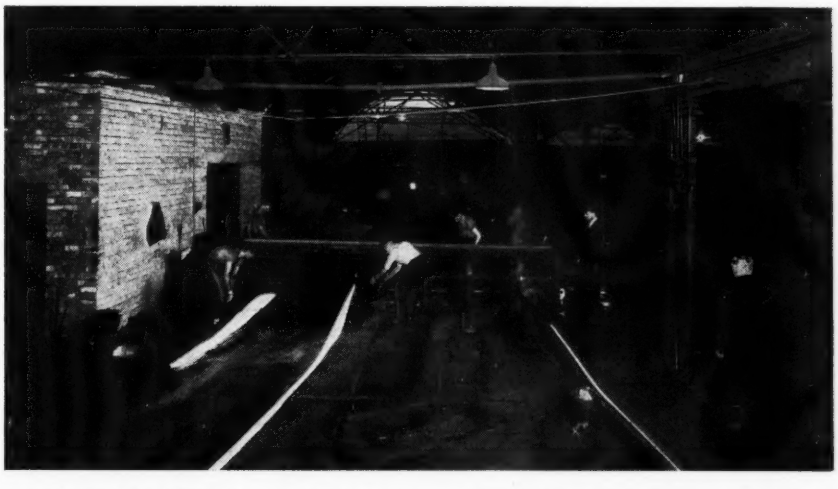
Electrifying a Steel Works

Substantial decrease in production costs

BEFORE 1937, when the concern was taken over by the Haybridge Steel Works, Ltd., production at these works had been on a comparatively small scale. An 8-in. mill was driven by a single-cylinder engine (over one hundred years old) supplied with steam at 70 lb. per sq. in. The rolls ran at a mean speed of 280 r.p.m., but at peak loads the speed fell off, so that the output was far below the capacity of the mill.

A contract for electrification was placed with Crompton Parkinson, Ltd., who installed the whole equipment ready for operation fifteen weeks later, the mill being idle for only three weeks.

Supply under a two-part tariff is taken at 11 kV from the West Midlands Joint Electricity Authority through a ring-main unit to a Crompton Parkinson compound-filled breaker housed in the main motor house alongside the transformer and low-voltage switchgear. A 450-kVA 10,500/415-V B.E.T. transformer supplies a "Klad A" distribution board through an isolator, the board consisting of an 800-A stator switch for the main rolls motor and a 250-A circuit-breaker for the finishing rolls motor. Air-break switch-fuses control small power and lighting circuits. A relay fitted to the metering equipment operates an alarm bell when the maximum demand in any half-hour period reaches a predetermined figure.



A general view of the mill in operation

A 350-h.p., 980-r.p.m. slip-ring motor was substituted for the steam engine and it drives the main roll train at 325 r.p.m. It is flexibly coupled to a double-helical reduction unit mounted on the same cast-iron bed-plate. A phase advancer designed to raise the power factor of the works load to unity is driven by V ropes from an extension of its shaft. It also increases the pull-out torque of the machine to 250 per cent. of full-load torque.

The finishing rolls, which were formerly lined up with the main roll train, have been replaced by a new two-stand finishing mill designed by the Steel Company in a position, relatively to the main roll train, that facilitates continuity of output. The speed has been raised to 400 r.p.m., which not only increases the mill capacity, but also gives a much improved surface finish to thin gauge flats. This mill is driven by a 150-h.p., 980-r.p.m. slip-ring motor coupled to a double-helical reduction gear unit in the same way as the main rolls motor.

Both mills can be stopped by push-button switches; the 350-h.p. motor can also be shut down from a point adjacent to the finishing mill. The 350-h.p. motor has a liquid starter and oil-immersed stator switch, whilst the 150-h.p. machine has a combined oil-immersed stator switch and rotor starter.

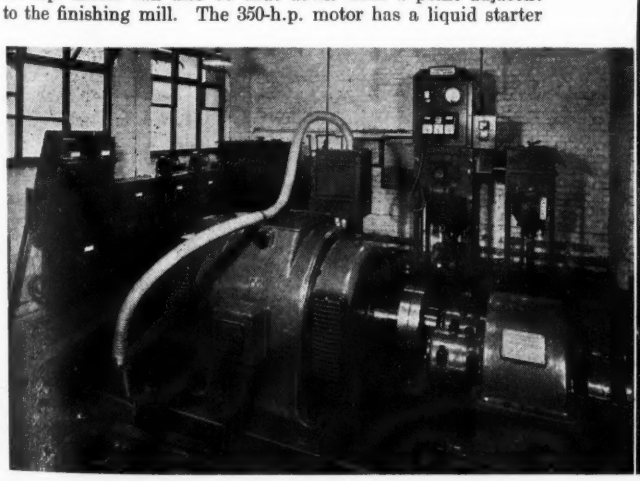
The shears, one for cutting 2-in. billets, and the other for finished rods and strip, were originally engine driven, the cylinder forming part of the unit. In each case, the cylinder, crank and crank pin were removed, and V-rope drives installed. The driven wheels were located on the crank pin discs by spigots, and bolted to the discs. The driving motor was in each case mounted on a raised plinth to bring it within reasonable distance from the driven wheel. A 12½-h.p. motor drives the 2-in. billet shears and a 7½-h.p. motor the smaller unit. Slip-ring motors are employed to accelerate the heavy flywheels.

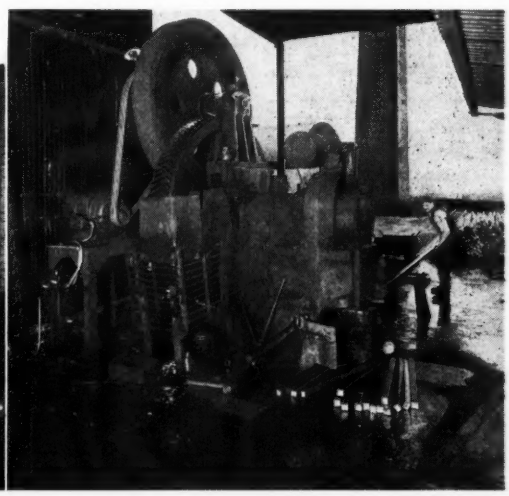
The speed of the roll turning lathe can be varied through a range of 5 to 1 by an infinitely variable reduction unit, the 12½-h.p. squirrel-cage motor being mounted on the framework of the unit and driven by V ropes. The exact speed required for turning any type of rolls, *i.e.*, steel, grain, chill, or alloy rolls, can thus be obtained. As turning speed is extremely critical for accurate production, fine speed adjustment is an important factor in the quality of the finished product.

Formerly, water for cooling the bearings and for the boilers was pumped from a well to an overhead 5,000-gal. tank by a steam-driven three-throw reciprocating pump. For pumping the smaller quantity of water now required a centrifugal pump, driven by a 3-h.p. squirrel cage motor, is used.

Instead of the old steam blower and pusher for the furnace a motor-driven blower unit and 10-h.p., squirrel-cage, 940-r.p.m. motor for driving the pusher mechanism are used. The steam-driven forge blower in the blacksmith's shop has been replaced by one driven by a fractional-h.p. motor.

The average output during a nine-hour shift is 20 to 26 tons, as compared with 7 to 9 tons before electrification. The plant has been operating for six months since the scheme was completed, during which period (including trials) the total energy consumption per ton of steel has been 70 kWh per ton. The power cost per ton is now less than one-third of what it was with the steam plant and owing to the increased output, the wages cost per ton has been halved, although the average





Left: The sub-station showing the switchgear units, transformer, distribution board, main motor stator switch, induction motor and reduction gear and phase advancer. Right: Shears for 2-in. square billets driven by a 12.5 h.p. slip-ring motor

New Diesel-electric Vessel

A 1,036-kW propulsion plant gives a trials speed of 14 knots

TRIAL trips of the twin-screw Diesel-electric ship *Patricia*, which has been built by Smith's Dock Co., Ltd., Middlesbrough, for the committee service of the Corporation of Trinity House, have now been successfully completed. The dimensions of the vessel are: registered length, 218 ft.; breadth moulded, 35 ft. 6 in.; depth moulded, 16 ft. On the official trials a mean speed of slightly over fourteen knots was obtained during a twenty-four hour run.

Power for propulsion is obtained from two English Electric 755-b.h.p. four-stroke six-cylinder (15 in. by 20 in. stroke) 375-r.p.m. heavy-oil engines direct coupled to 518-kW 550-V separately excited d.c. main generators and overhung 48-kW 220-V auxiliary generators.

The engines are mechanical-injection cold-starting units, of standard pattern except for a special marine type of bedplate, and are designed for compressed-air starting on all cylinders. The cyclic irregularity is specified to be not worse than 1/600. Primary silencers made by Smith's Dock Company and secondary silencers by Burgess are used. There are also two independent 60-kW 220-V generators by the English Electric Co., driven by high-speed oil engines made by the Associated Equipment Co. for supplying the auxiliary services.

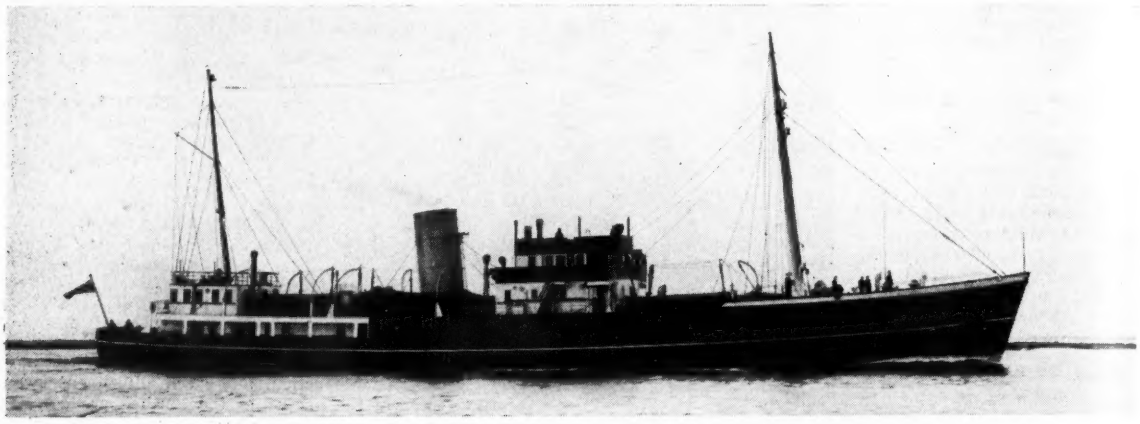
For cooling the main engines, Drysdale's "Centrex" pumps are installed in duplicate. Each unit consists of one pump for circulating distilled water through the jackets and heat exchangers, another for delivering sea water to the heat exchangers, and a common E.E. driving motor. Make-up water is obtained from an electric distiller with a capacity of 1½ gal. per hour supplied by the General Electric Co., Ltd. The auxiliary engines have their own pumps fed from the main engine cooling system.

Lubricating oil pumps (Drysdale "Vertoil") are also in duplicate, each unit comprising a scavenge pump and a pressure pump driven by a single motor. The former draws oil from the engine sump and delivers it to a two-compartment circulating tank, from which the pressure pump draws the oil and delivers it through coolers to the main engines.

Oil is purified by an Alfa-Laval centrifuge with heaters by Heatrae, Ltd., and a thermostatically controlled electrically heated "Streamline" filter. There is also an Alfa-Laval fuel-oil purifier. A separate lubricating-oil system, with Serck cooler and electrically driven salt-water cooling pump, is provided for each of the auxiliary sets. Motor starters for the pumps in the engine room were supplied by the Electrical Apparatus Co.

All the engines are started from two 50-cu. ft. air receivers, which are interconnected with two larger receivers installed in the shaft tunnel to meet the requirements of the compressed-air towing engine. The air is provided at 350 lb. per sq. in. by two vertical single-acting two-stage Reavell compressors with individual capacities of 40 cu. ft. of free air per min. and driven at 920 r.p.m. by electric motors.

The main generators are of the canopy-protected marine type with class B insulation throughout. Their bearings are of the disc-lubricated single-pedestal type to give satisfactory operation at an inclination of 15 deg. in any direction. Generally similar in construction to the main generators, the propulsion motors, each of which has a continuous rating of 665 s.h.p. at 200 r.p.m. and is forced-ventilated by a separate motor-driven fan, are directly coupled to the propellers through Michell thrust blocks. Two exciter sets (one stand-by) are installed for supplying the fields of the main generators and propulsion motors. Each set consists of a driving motor, a main generator exciter, and two motor exciters.



The Diesel-electric vessel "Patricia," which has successfully completed her trials

Independent control of each motor, and hence of each propeller, is obtained by means of two main controllers which regulate the fields of the generator and motor exciters. A telegraph on the bridge has six ahead positions, giving 30, 65, 100, 135, 170, and 200 r.p.m., and four astern positions, equivalent to 30, 65, 135, and 200 r.p.m. The voltage of the propulsion circuit is not permitted to exceed 550, and the system is designed to prevent overloading of the main generators.

A combined main and auxiliary control board is placed athwart the ship at the aft end of the engine-room. The main section is of the dead-front and the auxiliary section of the live-front type. For each main generator there is a cubicle containing a hand-operated double-pole double-throw switch. The circuit is made before being broken, so that a generator can be disconnected without interrupting the propulsion supply, and correct sequence of operations is secured by interlocks. There are also panels for controlling the propulsion motors, auxiliary generators, exciters, and essential and non-essential feeders.

Electrical equipment on the deck and in the holds includes a winch-operated 12-ton derrick, a winch for launching the boat, a windlass with three capstan heads, a warping capstan (aft), and Donkin's electro-hydraulic steering gear.

The provision storage chambers are refrigerated by a Hall's "Seamark" methyl-chloride plant. For fuel transfer, providing fresh water and general service, there are in each case two Drysdale pumps driven by Allen motors. The workshop contains a lathe, drill, shaper, hacksaw and grinder, all driven by a 5-h.p. B.T.H. motor.

The complete Diesel-electric propulsion equipment and its auxiliaries have been designed and manufactured by the English Electric Co., Ltd., to the specifications of Mr. R. Kingdom, chief ship surveyor and marine engineer to the Corporation of Trinity House, under whose supervision the vessel was constructed.

Electrifying a Steelworks (*Concluded from previous page*)

earnings of the mill hands have increased by approximately 75 per cent. The table shows the consumption per ton for various sizes of steel.

The whole of the electrification scheme was carried out by the Contracts Department of Crompton Parkinson, Ltd., in co-operation with Mr. C. W. Kieft, assistant managing director of the Haybridge Steel Works, Ltd. The installation and cabling were carried out by the Midland Electrical Installation Co. to Crompton Parkinson's specification.

CONSUMPTION OF ELECTRICITY PER TON OF STEEL PRODUCED.

Rounds and squares:	Output per shift. tons	cwt.	Total kWh per ton.
4in.	23	10	54
3½in.	22	10	56
3in.	21	10	58
2½in.	20	0	64
2in.	17	0	72
Flats:			
1in. × ½in.	25	10	50
1in. × ⅝in.	23	0	58
1in. × ¾in.	18	0	68
½in. × ½in.	23	0	58
½in. × ⅝in.	21	10	63
½in. × ¾in.	17	10	74
⅜in. × ½in.	21	0	64
⅜in. × ⅝in.	20	0	70
⅜in. × ¾in.	16	10	80

What E.R.A. is Doing

Valuable information derived from various investigations

THE seventeenth annual report of the British Electrical and Allied Industries Research Association for the year ended September, 1937, states that including researches in the field, for which the auxiliary laboratory serves as a base, nearly half the research work of the E.R.A. is now conducted by the Association's own staff. The laboratory is only two years old, but owing to pressure of industrial conditions it has proved increasingly difficult to obtain adequate attention and suitable deliveries from outside for the many pieces of special apparatus and parts required. It has been found advantageous to increase the workshop and storage facilities so as to meet most requirements without going outside.

The membership continues to rise. The income of £81,073 included £24,500 from the Department of Scientific and Industrial Research, £32,932 from electricity supply undertakings, and £19,737 from manufacturers. It is pointed out that the apparent surplus for the year of £13,496 (after transferring £5,000 to reserve) will not be available for this year's commitments, since substantially the whole of it is already required for work in hand, while the new year's income still comes to hand rather late.

In co-operation with the Central Electricity Board, designers of h.v. power transformers have received essential guidance in connection with the design of insulation and a clear and common understanding has been reached as to the features still requiring experimental investigation. A very complete investigation of surge phenomena has been made in relation to the grid and to the various protective and alleviating devices and apparatus already available in the market. New devices and methods have been suggested and experimental tests are to be conducted on an adequate scale. The degree of attenuation of surges by the lines themselves is important in determining what length of line in the vicinity of sub-stations should be given special protection by earth wires or other means; recommendations have been made and time should favour the chance of getting the records of lightning in this country sought by the Board.

Many researches into electrical phenomena and materials are proceeding with the aid of supply authorities and manufacturers

An opportunity of co-operating in fundamental research on permanent magnets with Prof. W. L. Bragg and the Permanent Magnet Manufacturers' Association occurred during the year and a new Committee was established.

Asbestos as an Insulator

E.R.A. spends about £25,000 per annum directly and indirectly on insulation problems; its work on hard composite dielectrics is receiving general recognition, not only in the electrical industry, and important work has been done on asbestos which will put this material definitely in the front line. For instance, the incidence of conducting particles has produced some valuable information. The electrical resistance of asbestos tape can be increased several thousand times by appropriate treatment. The same treatment also increases the electric strength of asbestos tape. As a result of this work it is now clear that if proper precautions are taken asbestos can be made a valuable insulator and can be applied to a number of new uses. The problem is still being pursued and the proposed purchasing specification for asbestos tape is in an advanced stage of completion, but is held up pending the results of further work. The study of the properties of asbestos-covered magnet wires has now been completed and the report detailing tests on asbestos-covered conductors has been almost completed.

The impulse electric strengths of a number of dielectric materials have been determined; these include representative thermoplastic and thermosetting materials, mycalex, glass and porcelain. Tests have been made on material in sheet, and in solid form with recesses for electrodes, lower strengths being obtained for materials in solid form. Comparative tests on glass and porcelain have been made with cup-shaped specimens. The impulse strength of porcelain was found to be approximately 500 kV/cm, and of glass about three times this value. The measured values could be considerably influenced by surface irregularities.

The time-lag curves of some typical 132-kV, 33-kV and 11-kV insulator systems have been determined, the measurements extending in the case of the two lower ratings into the region where breakdown occurs on the wave front. The minimum spark-over and the shape of the time-lag curve are unaffected by the presence of the rated power-frequency voltage.

A satisfactory technique for testing high-voltage cables has been worked out and the impulse electric strengths of impregnated paper-insulated cables suitable for 10-kV and 20-kV working pressures have been determined. The impulse breakdown strength was found to be approximately 1,000 kV/cm, the strength being about 10 per cent. higher when the conductor was positive than when it was negative. The strength of the 10-kV cable was approximately 10 per cent. higher than that of the 20 kV. From the experience gained it is considered that the testing of cables for higher voltages should present no difficulties, and it is proposed to extend the work in this direction. The question of impulse tests on cable joint boxes and terminals is also under consideration.

[*Elliott & Fry*
Mr. E. B. Wedmore, M.I.E.E., F.Inst.P., director and secretary of E.R.A.

Cable research continues; new proposals for current rating have been made (see ELECTRICAL REVIEW, January 21st), and a report (F/T116) will shortly supersede F/T14, which has been one of the most widely appreciated and used of all E.R.A. reports. The new report will be suitable for the pocket, although extended to deal with the influence of depth of burial (down to 18 ft.) on the standard rating. Research on concrete poles and overhead conductors is proceeding.

Experimental determinations of the resistance of varnished cloth to moisture have been commenced by the Association, and ageing tests are proceeding. Proposals have been drafted for a specification for a micrometer by means of which the thickness of fibrous materials can be measured under a definite pressure; this should ensure that concordant results are obtained by purchaser and manufacturer.

Information having been received from a Government Department that condensers for radio communication varied in quality with the source from which the paper was secured, with the co-operation of the paper makers differences in properties have been found, but the results obtained to date have not enabled a complete answer to be given as to the reason for the superiority of certain papers. Research on ageing of papers in air has been continued.

As the result of work on the effect of oil and grease on air-drying insulating varnish, a method of test has been developed for inclusion in B.S.S. No. 634 for this class of varnish. Regarding insulating pigmented enamels, it is now proposed to include both a sand test and a filter-paper test for determination of drying time, in the proposals for a specification for this class of enamel. In the determination of capability of varnishes to withstand high temperature when subjected to vibration, marked differences in behaviour were observed after four months' treatment.

A specification for bituminous filling compounds has now been issued (B.S.S. No. 688) covering five classes of compound, all those in general use in the electrical industry, except for cable boxes.

Glass and Porcelain Insulators

The investigations on the resistivity of glass and porcelain at Sheffield University under Professor Turner have been completed, and a report is also in preparation on the investigation of the arc-resisting properties of types of glass insulators recently developed, and giving also a comparison with similar properties of porcelain insulators. No tests of this type had previously been made, and some interesting results have been obtained. In addition to employing an uncontrolled power arc, steps were taken to fix the position of the arc on the insulator so as to reproduce the most severe conditions likely to be experienced. Arcing currents of 500 and 1,000 A were used for periods up to one second. The new "toughened" glass insulator was found to withstand arcs of great intensity up to six applications. "Pyrex" glass also withstood the arc well. Investigations on the effect of light-

ning surge have been carried out on samples of glass and porcelain and valuable data obtained on the impulse electric strength.

An investigation is now in hand with the object of developing a test to determine the suitability of the design of an insulator for operation under conditions of industrial or saline deposits. Impulse electric strength tests have been carried out on both porcelain and glass for comparative purposes, and consideration has also been given to the question of cement growth and to types of equipment for testing suspension insulators in service.

Surge Phenomena

The special transformer which was built for the purpose of investigating the distribution of surge voltages was utilised to develop a suitable method for measuring voltages across portions of the winding directly. For recording surges on transmission lines, methods have been developed for simulating the normal working conditions at the Association's laboratory, and prolonged tests have been made on the remodelled klydonographs. Six of these instruments have been installed during the year, three on a 33-kV line in the North of England and three on the 33-kV side of a 66/33-kV transformer, the higher voltage side of which is connected to an overhead transmission line. In neither case were any very severe surges indicated, although records of switching surges were obtained and also of the operation of a Petersen coil. In view of the difficulty of securing records of actual lightning strokes in this country consideration is being given to conducting a parallel investigation elsewhere.

Two further lightning arrestors, one for 11 kV and the other for 33 kV, became available during the year and have been tested in the same manner as others received earlier. A surge absorber suitable for a 66-kV line has also been tested during the year. All three of these protective devices were of British manufacture.

A number of additional magnetic links became available during the year, and have been distributed for use on overhead lines in districts where lightning troubles have been experienced in the past. Over 1,000 of these links are now installed, and an instrument has been developed for the purpose of showing whether these magnetic links had become magnetised or not. The latest type is entirely self-contained, portable, and very simple to use. In spite of the number of magnetic links now installed, none of these has yet been found sufficiently magnetised to afford a useful record of lightning currents.

Protective Devices

It is the practice to install an earth-indicating device in the wiring of oil tankers. The Institution of Electrical Engineers has asked the E.R.A. to ascertain the maximum safe current for an indicating device, permanently connected to earth and forming part of a switchboard on a vessel carrying bulk oil with a flashpoint of 65° C. or under. The electricity supply, for purposes other than main propulsion, is d.c. and limited to 220 V. The necessary research is being carried out by Dr. W. M. Thornton.

The standard fault report forms that have been distributed to supply authorities have now been received in sufficient quantity over a reasonable period to enable a second survey to be made on a basis of more up-to-date information than was available at the time of publication of report Ref. F/T94. The latest data will show a distinct improvement in general performance due partly to the replacement of a number of obsolete installations and partly to improvement in testing and maintenance routine.

In order that an overhead line may be adequately protected from the effects of lightning, it is desirable to measure the earth resistance of individual towers as distinct from that of the whole line of towers when inter-connected with the earth wire. The lifting of the earth wire for this purpose presents considerable difficulties, and several methods have been devised by the Association for making the measurement without doing this; it is hoped soon to issue a final report making specific recommendations for the most practicable method of test.

Coke Earth Electrodes

Regarding the current-loading capacity of earth electrodes, in addition to temperature records regular measurements are being made of the electrical resistivity of the soil, the resistance of the electrodes, the thermal conductivity of the soil and the rainfall. Tests with d.c. have yielded some unexpected results, as have also the preliminary investigations on short-time overloads with a.c. The latter indicate that provided the current is sufficiently large the earth resistance of the electrode increases to many times its initial value in a period of a few seconds, when the temperature at its surface approaches 100° C. The practical application of this is that if the earth-leakage protective gear has not operated by the time this temperature is attained, its probability of operation is very much reduced afterwards.

Concerning the use of coke to reduce the resistance of earth electrodes, after nearly five years' work it has not been found possible to make a definite recommendation for or against the use of coke, but it has at least been possible to give figures to show the reduction of resistance effected by its use and the reduction of seasonal variation of resistance. A further advantage is the increased current-loading capacity, but against these advantages the report sets out eight disadvantages, and it is left to the engineer to decide whether or not in any particular problem it is preferable to use coke breeze. The decisions will usually be reached by considerations of cost and reliability. Other important results obtained from these tests were that electrodes in some soils may take several years to recover from the effects of an exceptionally dry period, and despite two such periods in five years the ratio of maximum to minimum resistance of the electrodes was very much smaller than was expected.

The coke earth electrode is a new type which has the advantage of a much longer life than any metallic form of electrode and is particularly suitable for sub-stations where a low resistance is desired and the space is restricted, or where, as in the case of pole-mounted transformer sub-stations, it is desirable to bury the electrode below the ground level in order to eliminate the danger to animals of electric shock from the voltage gradient on the surface. The electrode consists essentially of a trench, vertical cylinder or horizontal mat of coke breeze into which is inserted a substantial metallic connection of small dimensions compared with the coke electrode.

Control Apparatus

The generating and testing plant at the E.R.A. laboratory, Perivale, was in constant service throughout the year. A small breaker which allowed the insertion of probes into the arc path has been used for experimental purposes, and a h.v. high-frequency oscillator has been designed and built, and put into service for continuation of the work on phenomena of the arc path.

The study of transient arc resistance, current density and other phenomena in the arc at zero pause has led to the conclusion that in many cases conditions cannot be adequately represented by a simple curve of restriking voltage and another curve of recovery of dielectric strength, but that in practice both curves are modified considerably. The finite transient resistance in the arc-gap becomes a third interacting factor in the system and tends to damp out high-frequency voltage fluctuations. It thus affects the voltage curve, while the energy which, in consequence of the resistance, appears in the arc-gap in the form of heat or ionisation modifies the curve of dielectric strength.

A restriking voltage indicator has been purchased and several new pieces of apparatus have been originated and developed for the work, including a voltage injector which works with an accuracy of two or three millionths of a second.

Circuit-breaker Patents

During the year a new patent application was made covering certain circuit-breaker improvements, and several patents have been granted on foreign applications based on existing E.R.A. British patents. An arrangement has recently been concluded on satisfactory licence and royalty terms with Sachsenwerke A.G. of Dresden, the main provision of which grants permission to manufacture differential piston blast switches under cover of the E.R.A. German patent (when granted) corresponding to E.R.A. British Patent No. 378493. Certain foreign licences have been granted on terms satisfactory to the E.R.A. and other applications for licence from important interests are under negotiation.

The important discovery of the effect of bacteria and moulds on the corrosion of condenser tubes has been further studied during the year. It is considered desirable to dispose of certain patent questions before releasing a report. The control of bacterial action by various types of inhibitors is being actively pursued.

A skeleton table of corrections to the Callendar table has been made, preparatory to drawing up and publishing a new set of steam tables. A new entropy diagram will also be prepared. Two new high-sensitivity creep-testing machines are now in operation.

Investigations are being made on the creep resistance of steels utilised in high-pressure and high-temperature superheater and steam pipe practice, since although in boiler construction the maximum saturated steam temperature to be considered is only of the order of 335 deg. C., such is not the case in those parts of the steam plant in which steam is superheated or through which superheated steam is carried to the prime mover.

Trolley-bus Rectifiers

2,000-kW equipment at Leytonstone

A GLASS-BULB mercury rectifier sub-station of 2,000-kW capacity was put into commission recently by the Leytonstone Borough Council Electricity Department for the purpose of supplying at 630 V that portion of the London Transport Board's trolley-bus system which is within the boundaries of the borough. A site in Waterloo Road was chosen for its convenience as a central feeding point, and the structure has been built on to an existing rotary sub-station.

The rectifier bank, which is believed to be one of the biggest so far provided for trolley-bus operation, was manufactured throughout at the Croydon works of the Nevelin Electric Co., Ltd. It consists of four separate 500-kW twin-bulb equipments, each operating from its own transformer, and, although designed to run as separate units, all four can be paralleled should the load require it.

The input is derived from the Corporation's 6,600-V, three-phase, 50-cycle mains and controlled by a seven-panel metal-clad switchboard of Switchgear and Cowans' manufacture, comprising three drop-down isolators and four automatic circuit-breakers, each of 150,000-kVA rupturing capacity.

The four transformers, supplied by Bryce, Ltd., are of the indoor core type, oil-immersed and naturally cooled, arranged for a maximum temperature rise of 35 deg. C. The primaries are delta connected with tappings at plus and minus 2½, 5, and 7½ per cent., operated by means of an off-load tap switch.

In order to avoid interference with local broadcast radio reception, 12-phase rectification was adopted. The transformers are placed on rolled-steel joists over pits, and each is separated by a brick partition. The partition supports the respective primary and secondary p.i.l.c. cables.

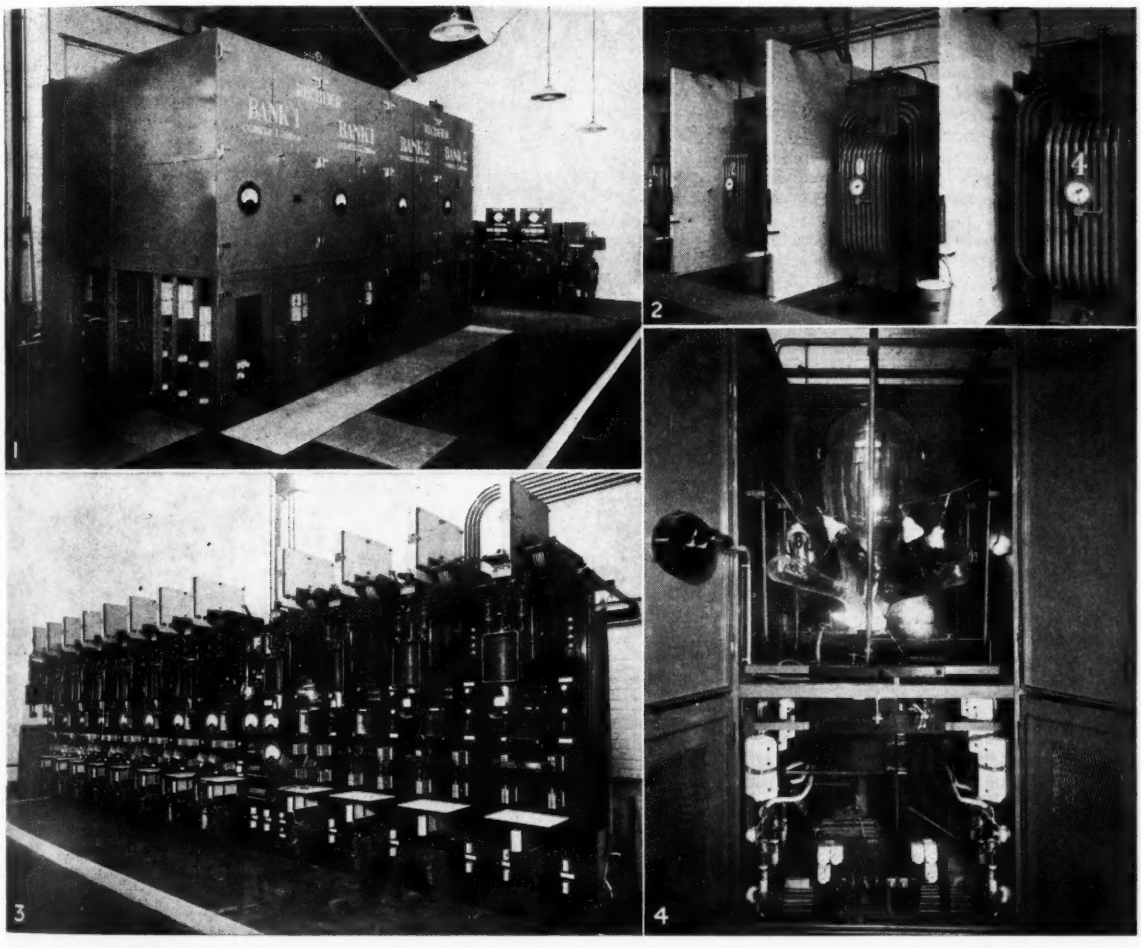
All interconnections, including the heavy cables to the d.c. switchboard, are carried in ducts in the floor. The rectifier cubicles contain six-arm bulbs mounted on withdrawable carriers, fan, ignition and exciter apparatus, high-rupturing capacity anode fuses, and the main anode balancing reactors, which ensure sharing of the load, not only between individual anodes, but also between each 500-kW unit. Other standard features include a method of ignition which obviates the use of moving parts inside the bulb, called "pinch-effect," and the use of special glass enabling the bulbs to be repaired at a low cost after years of continuous service.

Each 500-kW unit has an efficiency (per cent) at 5/4 load of 94, 4/4 load of 94, 3/4 load of 94.2, 2/4 load of 93.5, and 1/4 load of 92, and is capable of withstanding the following overloads: 25 per cent. for two hours, 50 per cent. for half an hour, 100 per cent. for 30 seconds.

The Bertram Thomas d.c. switchboard comprises four rectifier panels, eight feeder and a metering and test panels. Each feeder panel is provided with a high-speed auto-reclose circuit-breaker fitted with overloads and no-volt release, negative contactor and a double-pole knife switch. The rectifiers are provided with high-speed breakers also, which are arranged for reverse tripping.

A further sub-station of 1,000-kW capacity is in course of erection for similar duties at the main station situated in Cathall Road.

The two sub-stations were designed and erected in accordance with the specification of the borough electrical engineer, Mr. J. Wetherall.



Rectifiers for London Trolley Buses

1. Two of the rectifier banks. 2. The four transformers. 3. The d.c. switchboard. 4. One of the cubicles showing arrangement of glass bulb equipment

A New Cable Press

A lead press just installed at the Stockholm cable works of A/B Liljeholmens is said to be the first of its kind in Europe and is especially remarkable for the lead crucible, in which oxidisation is avoided by smelting in an atmosphere of gas. By delivering the lead free from lead oxide to the press, holes and cracks in the cable sheaths are avoided. The lead crucible is maintained automatically by thermostats as the proper temperature and, since a large quantity of lead (9 tons against 3 tons for normal presses) is to be kept in the crucible, the drop in temperature is exceedingly small when fresh lead ingots are put in. The regular temperature maintained and the solid design of the press enable very fine tolerances to be ensured in the thickness of the sheath.

Meetings and Discussions

A new a.c. resonance bridge designed for measuring resistances at high frequencies was described in a paper by Prof. C. L. Fortescue and Dr. G. Mole read before the Wireless Section of the I.E.E. on Wednesday. Mr. F. E. Rowland detailed the benefits of electricity to rural communities at a recent A.S.E.E. gathering, dealing with a number of aspects of the subject. Yesterday at the ordinary meeting of the I.E.E., Mr. T. E. Norris presented a paper describing a moving coil on-load voltage regulator giving smooth action over the range for which it is designed. The construction and operation of power condensers formed the subject of a recent E.P.E.A. paper by Mr. H. W. Biskeborn.

High-frequency Resistance Measurement

WORK carried out by post-graduate students at the City and Guilds College, South Kensington, prepared the way for the development of a form of a.c. resonance bridge suitable for measuring circuit resistances up to 30 ohms at frequencies up to 0.5 megacycles and up to 10 ohms at frequencies up to 10 megacycles.

The paper by Prof. C. L. Fortescue and Dr. G. Mole, which was presented before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 2nd, contains the complete theory of the bridge, together with constructional details. The accuracy actually obtainable appears to be of the order of 0.01 ohm for resistances up to 10 ohms at frequencies up to 10 megacycles.

An ordinary bridge has three arms, which are resistances. The other arm, which contains the circuit under test, is tuned to resonance, and so behaves also as a pure resistance. The balance is thus entirely resistive. But at high frequencies these conditions are modified by the presence of residual capacitances and inductances, and by the difficulty of constructing satisfactory variable resistances.

In the authors' bridge the effects of residuals have been reduced by making the resistance arms in the form of fine wires mounted axially in screening tubes, and the difficulty with respect to the variable resistance is overcome by the use of a screened straight wire and sliding contact. A Wagner earth is employed which brings the sliding contact to the potential of the screen. Neither its capacitance to earth nor the resistance of the contact affects the results under these conditions.

The ratio arms are made in the form of a single wire mounted in a screening tube, with a soldered connection to the exact mid-point. The maximum resistance which can be measured is thus equal to the slide-wire resistance. But the range of measurement can be extended at certain frequencies by inserting in the bridge arm an extra length of wire, which is assembled as a detachable plug box. This operation is not practicable at the higher frequencies owing to the terminal capacitances at intermediate points in the arm.

This new bridge is, in general, more sensitive than existing resonance methods of measuring reactance and resistance over the 1-10 Mc frequency range. Another bridge is at present being constructed, similar in principle but of smaller dimensions, which is intended to cover the frequency range of from 10 to 100 Mc.

Rural Electricity

THE uses of electricity in agriculture and horticulture were the subject of an illustrated lecture by Mr. F. E. Rowland (G.E.C.) which was delivered to members of the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS at Maidstone on January 27th, when Mr. E. E. Hoadley (borough electrical engineer) presided.

The lecturer remarked that no application of electricity appealed more strongly to farmers and those living in the country than lighting. To obtain the most effective results an adequate number of points should be installed, but this need not lead to extravagance, as suitable switching could be provided to prevent waste. While, in many situations, lighting from overhead was most effective, the latest practice for milking sheds when the cows backed on to a wall was to mount suitable fittings on the wall so as to illuminate the hind quarters of the cows.

Electric motors could be applied to farm machinery in a variety of ways. Each method had its advantages, a 7½-h.p. motor being adequate in many instances. In parts of Scotland where threshers were permanently fixed in farm buildings, the use of a motor of about 15 h.p. was quite common practice.

The Rothamsted experimental station had shown that electricity at 1.85d. per kWh compared favourably with tractor drive for threshing, while the equivalent figure for grinding was 1.36d. per kWh. Allowing for the difference between test conditions and those existing in practice, and also considering the greater convenience of electric drive, electricity might be used satisfactorily for farm drives at 2d. per kWh or less.

Fractional h.p. motors could be employed for many small power applications previously performed by hand, such as shearing, clipping, churning, separating, sorting, mixing, pumping &c. Such motors were very inexpensive, consumed less than a kWh per hour and would save their cost within a very short time.

The use of electricity for water heating and for raising steam for sterilising utensils, bottles and milking machines gave hygienic and space saving advantages, and electricity also provided an ideal drive for milk coolers and other machinery installed in dairies.

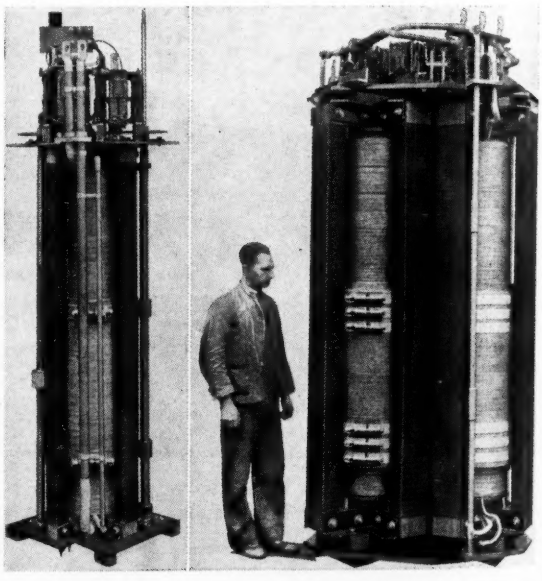
The chicken might enjoy the benefits of electricity to a greater extent than any other living creature. Electricity hatched it in an incubator; brooded it; lighted, ventilated and heated its house; mixed its food and warmed its water; tested and graded its eggs; and, finally, plucked and cooked it.

In the farmhouse electricity removed the burden of drudgery otherwise imposed upon the farmer's wife. It was a particularly convenient means for heating greenhouses, and also soil heating, the control of temperature being entirely automatic.

A New Voltage Regulator

VOLTAGE regulation under load by means of an improved regulator designed somewhat on the lines of an ordinary static transformer is described in the paper by Mr. E. T. Norris (Ferranti, Ltd.) that was read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 3rd.

In principle the device consists of an isolated and short-circuited coil which is made to move up and down the leg of a laminated iron core over fixed coils. Smooth voltage variation over any desired range is said to be obtained without switches, contacts, flexible leads, or windings in slots.



Left: Typical single-phase moving-coil regulator, showing multi-yoke construction. Right: Typical three-phase moving-coil regulator, showing assembly of modified single-phase units

The smaller single-phase regulators are of concentric construction with circular coils. For larger sizes the multi-yoke construction is employed to improve the magnetic flux distribution and reduce stray losses. The main core leg is divided into sections having the planes of their laminations at right angles. This, incidentally, gives a rigid mechanical structure, even for relatively long legs, needing little clamping framework.

The same principle is applied to the three-phase construction. Three single-phase units are modified for grouping in

triangular formation. The fourth yoke of each unit can be omitted, as the three-phase fluxes cancel out. The resulting space is utilised for mechanical operation. A rigid construction of the main core leg is again obtained by sectionalisation in two planes.

In both single-phase and three-phase regulators the coils are of the disc or the multi-layer type, depending upon the current and voltage. Coil supports, spacers, and oil-cooling ducts are provided where necessary, both mechanical and thermal design being the same as for ordinary transformers. The bucking and boosting coils are usually the innermost windings, with the primary coils assembled immediately over them. The moving coil is earthed and mounted with mechanical and electrical clearances between it and the fixed coils and yoke sides.

Cooling follows the usual practice. Small sizes may be air-insulated and air-cooled, but all others are oil-immersed in plain, tubular, or radiator tanks, depending upon the size. In most cases the whole of the operating mechanism is oil-immersed with the regulator.

The moving coil, clamped in two or more stainless-steel bands, is operated by a square-threaded shaft working on a nut attached to the coil clamps and driven through suitable gearing by hand or by motor. In single-phase units one, or in larger sizes two, of these shafts are employed. Three-phase regulators are driven by a central shaft operating all three coils.

Remote electrical operation of the moving-coil regulator requires relatively small power owing to the low mechanical forces. For all ordinary cases motors of the induction-disc split-phase type, similar in principle to many gramophone motors, are sufficiently powerful. The driving element consists of two iron-cored coils mounted on either side of a rotating copper disc. The phase displacement is obtained either by connecting a condenser in series with one of the coils or, in some three-phase circuits, by connecting the coils between appropriate phases and neutral. Flux interactions in the rotor provide the driving torque. The motor runs at a low speed (about 150 r.p.m.), so that little mechanical reduction gearing is required. One or more of these motors are mounted with their shafts vertical and drive the square-thread operating shaft through a single spur gear. The comparative inefficiency of this class of motor is not objectionable for such small ratings, particularly as the motor is run intermittently and for short periods. Moreover, to offset its inefficiency it has peculiar advantages for this type of work. The rotor is a plain copper disc, which can well be run under oil, being thereby automatically lubricated and protected from dirt and atmospheric conditions.

The starting current is practically the same as the full-load running current, thus eliminating special starting devices, and, as the motor can be stalled without damage, limit switches and overload devices are unnecessary. The starting torque is high, while the load torque rises almost linearly with decreasing speed, giving stable operation even under widely varying loads. Finally, the light weight and low speed of the rotor reduce the inertia of the mechanism so that electromagnetic brakes, automatically operated when the motor is switched off, are not needed to prevent over-running.

For testing and laboratory work the circular windings of the regulator permit its economical construction in very small sizes. Regulators of 15-VA output have been built. For these small ratings the multi-yoke construction is replaced by a cylindrical yoke of sheet steel, which also forms the outer case of the unit. The regulator is therefore self-contained and similar in shape to ordinary wire-wound tubular-resistance rheostats. A typical regulator of this construction gives 18 per cent. voltage variation in a 200-VA 230-V circuit.

Electrical Condensers

AT a meeting of the London Local Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on January 25th, Mr. H. W. Biskeborn read a paper in which he pointed out that condensers with mica and similar dielectrics and electrolytic condensers had limited applications and therefore were of little interest to power engineers, who needed the oil-impregnated paper insulation design.

Fifteen years ago the 250-V 50-cycle condenser occupied about 0.35 c. ft. and weighed about 40 lb. per kVA, compared with 0.1 c. ft. and 10 lb. per kVA to-day. This technical progress had resulted in greater speed of manufacturing output and lower cost of manufacture, thus widening the possible applications of condensers. One noticeable effect had been the diminished use of the elaborate and complicated types of compensated motors in favour of squirrel cage induction motors with simple control gear.

Oil condensers were built of sheets of thin aluminium foil, insulated from each other by several layers of paper. For circuits above 5,000-6,000 cycles liquid dielectric and metal electrodes, without any solid dielectric, were employed. In this country the generally used liquid dielectric was of the mineral organic hydrocarbon type. The primary advantage of chlorinated oils and chlorine-containing synthetic liquids was their non-inflammability, and their use and development in America was consequent on the high rebates granted by the fire insurance underwriters. Very little use was made of such chlorinated oils in Europe because of their chemical instability. Highly refined oils were not desirable, as the refinery processing resulted in a chemically unstable oil which during the life of the condenser would react with metal and result in acid formation.

The foil for the plates was usually aluminium of high purity, the thickness varying from 0.005 mm. for 200 V to about 0.007 mm. for the 400-600 V class. The paper usually used was kraft tissue, but a certain amount of pure rag was still used for special units. Cellulose tissues had improved greatly in the last few years, and it was possible to obtain comparable results to those given by the rag tissues at about 70 per cent. of the price.

The usual operating stress on paper-insulated units with oil impregnation was 12-13 kV per mm., but might be doubled, due to variations in the winding of the foil and paper and to conducting spots in the paper. In power condensers the use of three layers of paper was accepted as the minimum by life tests. It was usual for sections or individual elements of a condenser to be separately fused internally. The N.E.M.A. in the United States specified that all standard ratings should be capable of operating continuously with 10 per cent. increase in the circuit voltage and a maximum short-time voltage increase of 20 per cent.

The shunt condenser had established itself for power-factor improvement. The construction of the series-connected unit was generally the same, but instead of being shunted to a line or load, as units, was connected across motor terminals or across an electric-furnace phase, with the result that a leading current was injected into the system to neutralise the reactance drop of the line. The sphere of application of the series condenser placed it directly in competition with induction regulators, booster transformers, and automatic on-load tap change gear.

Discussion

In the subsequent discussion Mr. W. C. Kennett said that on the Continent and in the Dominions there was a distinct appreciation of the use of condensers. In this country, however, the matter was largely left to the consumers who, as a general rule, did not seem keen on it. The American and the V.D.E. rules referred mainly to the test voltages to be applied. There was no British specification at all.

Mr. G. M. S. Sichel said large power stations usually found that instead of the power factor lagging it was leading and there had been cases in London where it had reached the instability point. While in the case of the small industrial user, therefore, p.f. correction was necessary or desirable, from the point of view of the supply authority the introduction of p.f. correcting apparatus was not desirable. It also appeared that condensers had a somewhat lower factor of safety than other types of apparatus.

Mr. F. E. Heath said that a time switch was a desirable feature in a bank of condensers on consumers' premises so that they could be switched out of circuit when the factory closed down. Mr. F. Bird suggested that when a condenser was likely to give trouble it would show symptoms in temperature rise; also that 13 kV per mm. was a high stress for the paper used in condensers. There was always the possibility of pinholes in two papers registering, but that risk was less when three papers were used. He did not agree with the author's preference for the hermetically sealed can type of condenser over the tank type. It occupied more space and there was more difficulty in keeping the temperature down.

Mr. R. A. Mildner suggested that breakdown was a thermal consequence and the author agreed, although other factors came in. Information on this subject had been issued by the Micafil Company and was the result of experiments carried out by Dr. Hans Stäger, at Basle, published in 1928.

In reply to other questions the author said that there was no routine method of condition-testing condensers, but they should be very completely fused so that a burnt-out element would soon be discovered. It was necessary to wait for an element to break down. Although temperature rise was always an indication that a condenser was going to break down, there were other possible causes which would not be indicated by temperature rise. Three-paper condensers were capable of withstanding approximately 100 per cent. greater voltage before they started to fail, and the failure progressed more slowly than with two-paper condensers. The three-paper condenser costs more to make, however.

Industrial Research

Progress in many directions

THE annual report of the Department of Scientific and Industrial Research for the year 1936-37 (published by H.M. Stationery Office at 3s. net) records substantial progress in nearly all directions, both in investigations carried out in establishments of the Department itself and in the laboratories of the numerous research associations formed on a co-operative basis by various industries under the Department's auspices.

The financial resources of these organisations maintain an upward tendency. The aggregate income subscribed to them by industry has now reached almost £250,000, and the Government's grants amount to nearly half this sum. The Department's total net expenditure was £583,230, an increase of £11,399 on the preceding year, allowing for £246,950 received in payment for work done, as contributions and by sale of by-products, &c. The National Physical Laboratory's expenditure was £105,589 more than the £138,492 received for work done.

Efforts are being made to strengthen the contacts between industry and the N.P.L. With improved conditions of industry the basis of the charges made for special investigations and tests have been reviewed, and it is anticipated that some reduction of the charges may be possible in particular cases. Arrangements have also been made by which the staff of the Laboratory will be available to visit works to study practical problems of production and to plan investigations and carry them out on suitable terms under the conditions obtaining in manufacturing practice. The new development is one which should prove attractive to industry.

The report briefly reviews the activities of research organisations, including the Fuel Research Board, the Radio Research Board and the many investigations which are being made into the preservation and storage of foodstuffs. A marked awakening of interest in the preservation of fruits and vegetables by freezing is evident in the trade, and a special programme has been undertaken to settle technique.

Food Preservation

The Food Investigation Board has experiments in progress on the value of ultra-violet light in prolonging the storage-life of meat. The light does not penetrate far into tissues, and in meat the intensity at a depth of 0.2 mm. is only one-thousandth of the intensity at the surface. Intensities of the order of 800 microwatts per sq. cm., applied for 1-5 min., result in an appreciable reduction in the numbers of bacteria and fungi on the surface of foodstuffs. On the other hand, irradiation for 5-10 min. with this intensity produces oxidative rancidity in thin films of fat. The value of the method therefore depends upon the balancing of these two effects.

An analysis of the results of irradiating bacteria in nutrient solutions with γ-rays, whereby abnormally long forms are produced, has been published. The lethal effect of soft X-rays (K-radiations of aluminium and copper) on thin films of organisms is being investigated.

Study by the Road Research Board of the mode of failure of road surfacing necessitates knowledge of the stresses imposed by the tyres of vehicles. One of the instruments now under trial for making such measurements utilises the changes of resistance of a special carbon element under varying pressure, the variations being shown on a cathode-ray oscillograph.

When carrying out tests on a public road on the durability of "carpets," it is necessary to know how many tons have passed over the road when the road was wet and how many when it was dry. A "wet-road clock" has been constructed at the Laboratory to record the periods during which the road is wet. The method depends on the difference in the electrical resistance of the wet or dry surface. Contact strips have been laid in the road surface close to the Laboratory and the signal leads pass inside the building.

The Research Association of British Rubber Manufacturers has fully examined the production of electricians' rubber gloves and rubber mats for switchboard platforms in order to make possible the preparation of British standard specifications.

Lighting Research

The staff and work of the British Colliery Owners' Research Association was transferred a year ago from Birmingham University to the Royal School of Mines in London. Regarding underground illumination the investigation of the life and efficiency of bulbs for miners' lamps has been continued, and it is anticipated that a report by the British Standards Institution Sub-Committee will be forthcoming shortly. The discharge curves for acid and alkaline batteries have also been studied by this Committee. Further tests on visibility in a dusty atmosphere were carried out with lights of different colours. These indicated that with a yellow light, back-glare is appreciably less than with a bluish light when the dust particles in suspension are of a size commensurate with the wavelength of light.

The application of a small 150-c.p. mercury discharge lamp to underground lighting has been tested at a Warwickshire colliery, comparison being made with the ordinary M.L. compressed-air-driven lamp employing a metallic filament. Following these tests improvements have been made and two lamps are now under test, one in South Wales and the other in Yorkshire.

The photo-electric daylight-factor meter that had been developed for the rapid measurement of daylight in the interior of buildings has now been placed on the market and has been the subject of a number of inquiries from medical officers of health and others. Work has been actively pursued during the past year on the relative merits of light of different colours for carrying out visual tasks of various kinds.

The available experimental evidence for and against the use of coloured light for motor car headlamps shows that "none of the claims made in favour of using a coloured and in particular a yellow, head light beam, rather than a white beam of no greater power, has been substantiated."

The effect of a glaring light in reducing the sensitivity of the eye at the fovea, that is, when the gaze is directed straight at a test spot, has been investigated in previous years, and experiments have now been made to determine the effect of the glaring light when the gaze is diverted from the test spot at angles up to 50 deg. The results may be expressed in the same convenient form as that used for the work on foveal vision, that is, by the increase of "equivalent background brightness" which takes place.

The investigation of the relation between the illumination required for the efficient performance of a visual task, and the contrast of brightness by means of which the eye perceives the details in the task, has now been completed.

Glassware Investigations

The British Scientific Instrument Research Association has evolved an electrical method of assessing the potential durabilities of polished surfaces of optical glasses. Study of the electrolysis associated with instruments in which moving parts are immersed in liquids has made it possible to recommend materials that are more free from the risk of corrosion.

There are many potential sources of the blackening that occurs in gas-discharge tubes, especially those in which mercury is employed. Methods of treatment of the glass and of the other component parts of the discharge tubes have been evolved by means of which the risk of blackening occurring has been considerably reduced.

The Association has added to its equipment control apparatus specially designed to enable the temperature of an electrically heated furnace to follow, with a very small margin of error, a predetermined time-temperature programme. The immediate use which is being made of the apparatus is in connection with the annealing of optical glasses, but its acquisition by the Association will enable other investigations to be undertaken, the prosecution of which has hitherto been prevented by the lack of an efficient furnace-control system.

Patents

During the year six British patent applications were filed and ten British patents and patent applications were allowed to lapse or were abandoned. The new applications cover, among other things, inventions dealing with synthetic resins and cathode-ray valves. Further licences have been granted under the British patents for the anodising and colouring of aluminium and aluminium alloys, for protecting magnesium, and for the manufacture of fuel burners and fuel distributors. Another firm is entering into an agreement with the Department similar to those in connection with the various radio patents arising out of the work of the Radio Research Board.

Firedamp Detectors

The Secretary for Mines has made an Order extending until July 31st, 1938, the Coal Mines General Regulations (Firedamp Detectors) which were made in 1935 to require and regulate the provision of firedamp detectors for use by workmen employed underground. These Regulations had already been extended until January 31st, 1938, but the Departmental Committee set up by the Secretary for Mines to inquire into the working of the Regulations has now recommended the further extension to give it time to complete its report, and to enable fresh Regulations to be established.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Built-in Lighting Units

To meet the requirements of modern architecture without sacrificing lighting efficiency to aesthetic appeal HOLOPHANE, LTD., Elverton Street, Vincent Square, S.W.1, has developed a range of forty-five "built-in" lighting fittings the unit construction of which will permit an unlimited number of other designs to meet special requirements.

Holophane "built-in" units of the circular flush and rectangular semi-recessed types

Correct control of the lighting is essential in recessed fittings to secure efficiency, and this is achieved by using the now well-known "Holophane Controlens" and a series of special prismatic reflectors. The "Controlens" are prismatic glass plates of various designs to suit different light distributions and having all the optical properties of lenses. The range includes square, round, flat and dished shapes. The standard units are obtainable in flush, semi-recessed or close-ceiling forms, thus permitting uniformity of design to be preserved throughout a building.

The lighting of shop windows, counters and exterior displays is specially catered for by two units—one a square plate and the other a round dish unit. Two different light distributions are available with these units to meet the spacing ratio requirements.

Where a decorative effect is required side panels of coloured opal can be incorporated in the semi-recessed and close-ceiling units, and the metalwork of all units can be obtained in colour-sprayed enamel, chromium plate or natural bronze finishes. Special types of fitting are made for hospital operating theatres and dental surgeries.

Freedom from glare, a high lighting efficiency and easy cleaning are features of outstanding importance.

Quick Boiling Kettles

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has recently introduced a new range of quick boiling, heavy-gauge aluminium kettles in three sizes with capacities of 2, 3 and 5 pints, respectively. They are moderately priced and possess large lid openings and wide spouts for quick pouring, bakelite (instead of wood) handles, and heat resisting porcelain feet.

One of the new G.E.C. kettles

The heating element in each kettle is built to withstand hard treatment, being of the sheathed wire type exactly similar to that used in the radiant hot plate. The heating coil is contained in a copper tube finished in chromium plate from which it is insulated by a refractory. A thermal cut-out in the form of two bi-metal strips causes the ejection of the connector in the event of overheating.

The loading of the two-pint size is 750 W, and that of the two larger sizes 1,500 W. It is stated that 3 pt. of water can be boiled from cold in 7½ min. and 5 pt. in 12½ min.

Miniature Fuses

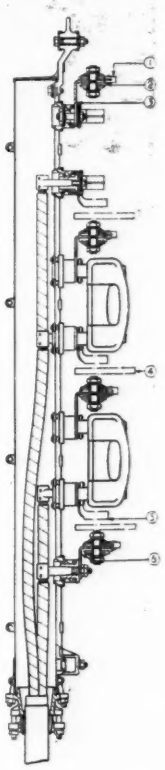
We are informed by QUADRANT CARBON & METAL PRODUCTS, LTD., Cumberland Road, Stanmore, Middlesex, that they have arranged to manufacture in England the "Littelfuse" products previously made in the United States. The range of fuses available extends from 5 mA at 250 V for affording high-speed instrument protection to 2 A at 10,000 V for radio and similar apparatus. The former are rated at their blowing point with a 10-sec. interval; the larger types are designed to carry 10 per cent. overload indefinitely and to blow within one minute on 50 per cent. interval. Included in the list are also fuses at lower voltages for heavy aircraft duty and up to 3,000 V for telegraphs. Mountings of various kinds for these fuses are also available.

Another production is a neon pocket size tester weighing 1¾ lb. for indicating voltages at upwards of 90 V d.c. and 60 V a.c. in which the lamp lights up with 0.5 mA.

Selective Disconnecting Box

An overground disconnecting box has been introduced by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1, with a view to enabling any circuit to be changed over from one sub-station feed to another without interrupting the supply. A spare copper link is inserted between the existing bus-bar connection and the bus-bar from which the cable is to be fed. The original link is then withdrawn and kept as a spare for the next change-over. All links up to those of 500-A rating are of the same size.

The bus-bar connectors support a stud, threaded at each end, which passes through the bus-bars situated one above and the other below the bus-bar connector. The stud and nuts are insulated from the bus-bars by means of "Tufnol" tubes and washers. In order to make contact between the bus-bar connector and either of the bus-bars, a copper link is inserted between the bus-bar connector and the bus-bar itself and tightened, to ensure good electrical contact. For inserting and removing the copper link a standard insulated handle is used.



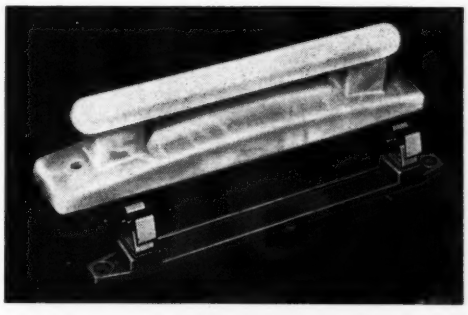
The Henley overground disconnecting box showing (1) copper link with "U"-shaped slot; (2) duplicate copper bus-bars; (3) tinned copper phase-bus-bar connector; (4) dividing fillet; (5) fuse ammeter sockets; and (6) tinned copper neutral bus-bar connector

The bus-bars for the neutral are arranged in a similar manner to those for the phases. Duplicate bus-bars can also be supplied for a fifth core. The duplicate bus-bar selective arrangement can be used with 60-, 150-, 300- and 500-A units. Laminated bus-bars each up to 650 A can be fitted. This selective arrangement does not increase any of the dimensions of the box-type units, and these can, therefore, be fitted in standard overground disconnecting box shells or made up as panels on a wrought-iron framework.

If provision for an alternative feed is not immediately necessary, these units can be fitted with one set of bus-bars and the fittings and duplicate bus-bars can be added later.

Strip Lighting

A new "Linolite" moulded fitting has been introduced recently by LINOLITE, LTD., 100, Victoria Street, London, S.W.1. It is a decorative two-piece fitting in "Beetle" plastic and houses a "Maxtrip 2" opal or opalised lamp. The bakelite case carrying the contacts can be fixed and wired independently of the cover, which may be screwed on after decorating is finished. "Knockouts" are provided at the sides and ends for surface wiring and the curvature of the cover is designed to avoid warping.



The new "Linolite" moulded fittings

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Lamps for Ultra-violet Therapy

A scientifically designed irradiating unit for ultra-violet therapy whereby the user has a choice of two different wave bands has recently been introduced by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2.

The Philips prescription model ultra-violet lamp

Known as the "Biosol," the unit is supplied in three different types—as a clinical model, a prescription model for home use under medical direction, and a solarium model for ceiling mounting.

The burner in each case is a tubular quartz lamp in which an arc discharge through mercury vapour is generated between electrodes. The mercury content of the burner is extremely small, so that the patient may be treated with the burner directly overhead without the slightest danger.

The full emission spectrum extends from the infra-red region down to the shortest wavelength measurable in air, *viz.*, 1,850 Au, and in the clinical models exceeds 13,000 ergs per sq. cm. per sec. at 2,967 Au (the optimum erythema wavelength).

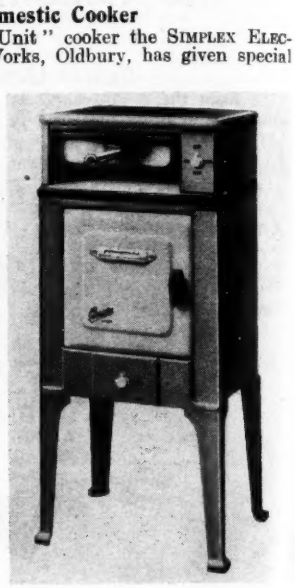
A "Dorno" filter, which is readily adjusted over the burner, gives a spectrum which approximates very closely to sunlight—the so-called "Dorno region." By cutting off the unwanted short waves, the filter permits the application of a far greater amount of the required radiation before the limiting factor of erythema is reached.

The burner is mounted in a specially constructed reflector, which increases the effective intensity threefold and ensures an even distribution of radiation at as short a distance as 20 in. The output is such that an erythema can be produced on a normally sensitive adult at 20 in. in one minute with a very low energy consumption.

The units are made to operate over a wide range of a.c. voltages, are easily adjusted, compact and portable.

Small Domestic Cooker

In designing the "Creda Unit" cooker the SIMPLEX ELECTRIC CO., LTD., Credenda Works, Oldbury, has given special attention to the requirements of the small household or flat.



The "Creda Unit" cooker

The cooker comprises two main portions—the oven and griller units, so that the oven can be installed in consumers' premises and the griller unit added later to form the complete cooker, the same option applying also to the legs.

The general lines of construction are the same as in the standard "Creda" range, the oven interior having pressed steel sides which are removable for cleaning, lagging for heat retention, three-heat control for the oven and griller and a thermometer in the oven door.

The oven (dimensions 11 in. each way) has a 1¼ kW element, and the 2 kW element in the griller unit serves the 5-in. by 12-in. by 12-in. grilling chamber, and a 10¼in. by 7-in. boiling plate. As an extra, "Credastat" thermostatic oven control can be obtained.

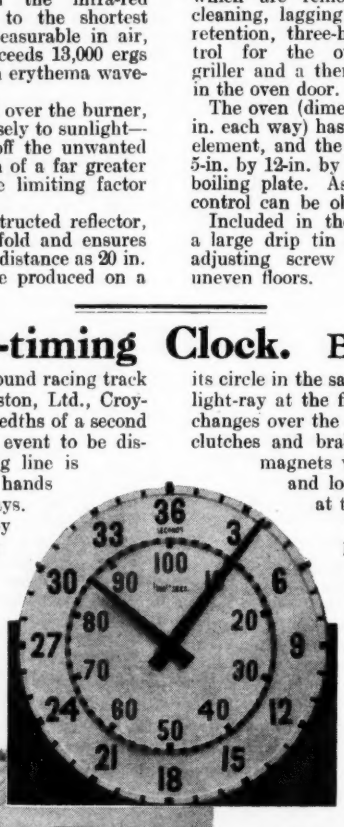
Included in the equipment provided are two rod shelves, a large drip tin and a grill pan. A special feature is an adjusting screw in one of the legs to secure firmness on uneven floors.

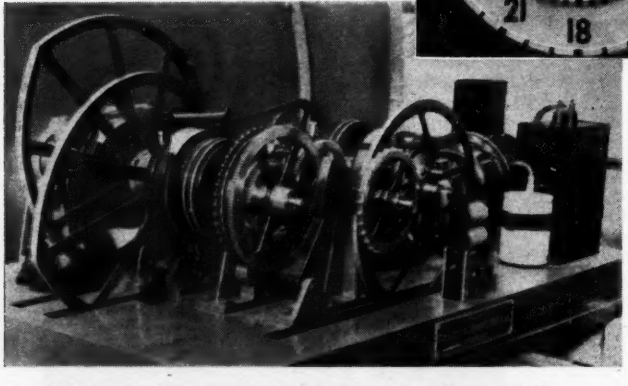
A Novel Race-timing Clock. By T. R. Robinson

A CLOCK recently constructed for a greyhound racing track in Scotland by Messrs. Gillett & Johnston, Ltd., Croydon, shows both full seconds and hundredths of a second on a large dial, and enables the time of an event to be displayed to spectators as soon as the finishing line is crossed, the starting and stopping of the hands being controlled by the interruption of light rays.

Power for operating the hands is supplied by a capacitor-type synchronous motor driving a worm-reduction gear from which the two hands are independently driven by means of roller chains.

Magnetic clutches are employed to couple and uncouple the hand spindles from the continuously rotating worm-wheel spindle at the desired moments, and powerful externally-contracting brakes lock the hands at the instant that the drives are disconnected. The return of the hands to zero in readiness for further timing operations is also governed by the driving motor and a relay circuit controlled by a hand-switch.





The race-timing clock mechanism, and (above) the dial

When a light-ray at the starting line is broken a photo-cell operates a relay, and simultaneously energises both the clutches and the brake pull-off magnets. This sets the hands moving, the hundredths of seconds hand revolving once per second, and the longer or full-seconds hand advancing one division of its circle in the same time. The action continues until a further light-ray at the finishing line is broken, when a second relay changes over the connections, opening the circuits of both the clutches and brake pull-off magnets, and energising pull-on magnets which apply the brake shoes to their drums and lock the hands securely at the reading shown at the instant of stoppage.

The hands are restored to their original position by an ingenious "zeroizing" mechanism. Attached to the spindle of each hand is a heart-shaped cam, the curves of which are such that pressure at any point will swing the cam to the position where its smallest diameter lies under the point of pressure. The pressure is applied by a weighted lever provided with two small rollers which engage with the cams, and the descent of this lever is regulated by an eccentric cam. The cam is, in turn, controlled by a trigger release which, when operated by the zeroizing switch, permits a pawl mounted on the eccentric cam to engage with the continuously revolving drive wheel of the zeroizing mechanism.

The pawl on the eccentric is normally held away from the drive wheel by a pin projecting from the pawl-tail. This pin rests upon the armature of the trigger-release magnet, and the cam therefore remains stationary until the energising of the trigger magnet withdraws the armature. As soon as this occurs, the armature releases the pawl and the latter engages with the ratchet-shaped teeth of the drive wheel, causing cam and drive-wheel to rotate together. During the first 180 degrees of the eccentric movement the lever is lowered at an even speed, and the rollers on it move the heart-shaped cams to the zero position. The further rotation of the cam lifts the lever to its original height, and when this is attained the drive to the eccentric is unlocked and brought to a standstill.

An additional cam mounted beside the eccentric is employed to pull off the brakes mechanically during the zero movement of the hands, and light springs restore and hold the shoes in contact with their drums when the zero point is reached.

Argentine Electrical Imports

Keen competition

FROM the recently issued annual foreign trade returns of the Argentine have been extracted the following figures showing the imports of the principal groups of electrical machinery and apparatus in 1936, notes of increases or decreases compared with 1935 being added.

These statistics make an interesting supplement to the information regarding the Argentine market which appeared in the ELECTRICAL REVIEW of December 10th last, when the D.O.T. report was reviewed. They confirm the statement that the market is highly competitive. At the same time it is expanding again as a whole, the total value of the imports in the apparatus group in 1936 having been 30 per cent. above the 1932 level. The cable group showed up well in 1936 also, with the United Kingdom figuring prominently in all lines except underground telephone cable. The values, which are those adopted by the Argentine Customs, are in paper pesos, worth at the current rate about 17 to the £ sterling.

With regard to local manufacture of electrical products, some information is available in the preliminary returns of the industrial census for 1935 which have recently reached this country. There were in that year 77 establishments engaged in the manufacture or repairs of motors, including parts and coils, with a total production valued at 696,563 pesos; 47 establishments manufacturing unclassified electrical apparatus valued at 7,307,000 pesos; 113 establishments making or repairing radio apparatus and parts, with a total production valued at 6,260,190 pesos; and 147 establishments which are described in the returns as electrical installations, the total output of which, including repairs, was valued at 832,785 pesos.

	1936. Pesos (000).	Inc. or dec. on 1935. Pesos (000).
Accumulators and parts—		
Total	1,310	− 100
From Germany	277	+ 51
„ United States	698	− 98
„ Japan	20	− 10
„ United Kingdom	122	+ 2
„ Canada	104	− 56
Batteries—		
Total	1,633	+ 408
From United States	1,457	+ 467
„ United Kingdom	44	− 8
„ Denmark	120	− 3
Ammeters and voltmeters—		
Total	124	+ 16
From Germany	47	+ 9
„ United States	25	− 7
„ United Kingdom	19	+ 7
Radio-telephone apparatus—		
Total	843	+ 23
From Germany	131	+ 93
„ United States	568	− 87
„ Holland	89	+ 38
„ United Kingdom	46	− 26
Receiving sets—		
Total	3,251	+ 541
From United States	2,529	+ 385
„ Hungary	216	+ 103
„ Holland	441	+ 46
„ United Kingdom	40	+ 18
Amplifiers and loud speakers—		
Total	444	+ 97
From United States	370	+ 130
Radio-telephone parts—		
Total	2,636	− 244
From Germany	233	− 177
„ United States	1,904	+ 84
„ United Kingdom	173	− 72
„ Holland	273	− 77
Telephones—		
Total	598	+ 195
From Sweden	26	− 9
„ United Kingdom	18	− 212
„ Germany	85	+ 47
„ Belgium	463	+ 387
Telephone material—		
Total	841	+ 126
From Belgium	253	+ 181
„ United States	46	− 64
„ United Kingdom	285	− 165
Heaters, toasters, etc.—		
Total	166	+ 3
From Germany	113	+ 17
„ United States	26	− 20
„ France	16	+ 4
Vacuum cleaners—		
Total	209	+ 105
From Sweden	138	+ 61
Incandescent lamps—		
Total	1,717	− 289
From Germany	101	− 122
„ Belgium	151	+ 19
„ United States	128	+ 48
„ Japan	794	+ 259
Incandescent lamps—contd.		
„ Holland	123	− 292
„ United Kingdom	167	− 30
„ Russia	141	− 109
House-service meters—		
Total	2,206	+ 721
From Germany	1,471	+ 678
„ Austria	156	− 124
„ Canada	44	− 1
„ United States	47	− 4
„ United Kingdom	26	+ 7
„ Switzerland	287	+ 106
„ Sweden	111	+ 56
Switches, circuit-breakers, cut-outs, fuses, etc.—		
Total	1,175	+ 15
From Germany	730	− 130
„ United States	152	+ 48
„ United Kingdom	124	+ 44
„ Italy	30	− 2
„ Belgium	96	+ 6
Change-over switches—		
Total	945	+ 312
From United Kingdom	885	+ 382
Distribution switchboards—		
Total	382	+ 309
From United States	315	+ 310
Insulating Tubes—		
Total	970	− 37
From Germany	754	+ 54
„ United States	84	+ 6
„ United Kingdom	124	− 89
Electrical materials, unspecified—		
Total	2,810	+ 1,000
From Germany	953	+ 233
„ United States	1,057	+ 577
„ France	40	—
„ Italy	23	+ 3
„ United Kingdom	223	− 17
„ Sweden	13	− 27
„ Switzerland	115	+ 12
Cable and wire, up to 5 mm., covered with cotton, rubber, etc.—		
Total	1,673	+ 371
From Germany	422	+ 122
„ United States	122	+ 52
„ United Kingdom	710	+ 70
„ Canada	44	− 16
Ditto, over 5 mm.—		
Total	436	− 124
From Germany	110	+ 17
„ United States	94	+ 54
„ United Kingdom	168	− 202
Cable and wire, up to 5 mm., lead-covered—		
Total	253	+ 128
From Germany	77	+ 57
„ United Kingdom	85	+ 18
„ Sweden	28	+ 7
Ditto, over 5 mm.—		
Total	1,024	+ 491
From Germany	105	+ 50
„ United Kingdom	1,295	+ 114
Unspecified cable and wire, not dutiable—		
Total	73	− 103
From Germany	48	− 50
„ United States	48	− 50
„ United Kingdom	6	− 15
Cable and wire, silk-covered—		
Total	45	− 7
From Germany	14	+ 4
„ United States	9	− 2
„ United Kingdom	8	− 7
Flex—		
Total	2,148	+ 1,795
From Germany	109	+ 37
„ United States	417	+ 376
„ United Kingdom	1,552	+ 1,362
Telephone cable, underground—		
Total	4,247	+ 1,361
From Germany	2,940	+ 1,480
„ Czechoslovakia	114	− 77
„ Holland	204	− 65
„ United Kingdom	463	+ 281
„ Sweden	90	− 125
Telephone cables of iron or steel, covered—		
Total	407	+ 175
From Canada	43	− 117
„ Norway	98	+ 26
Accessories for underground cables—		
Total	75	− 20
From Germany	57	− 23
Insulating tape—		
Total	245	+ 29
From Germany	43	+ 23
„ United States	88	+ 10
„ United Kingdom	60	− 13
„ Japan	10	+ 1
Dynamos and motors over ½ h.p.—		
Total	2,812	+ 1,016
From Germany	961	+ 461
„ Sweden	492	+ 163
„ United States	451	+ 151
„ Italy	127	+ 50
„ United Kingdom	351	− 17
„ Denmark	69	+ 8
„ Holland	113	+ 82
„ Switzerland	143	+ 48
Fan motors—		
Total	221	+ 51
From Germany	57	+ 23
„ United States	112	+ 34
„ Japan	18	− 26
Other motors up to ½ h.p.—		
Total	175	+ 75
From United States	128	+ 60
„ United Kingdom	28	+ 15

In the Courts

Diversion of Electricity Supply

AT Exeter Police Court recently William C. S. Hill, Starcross, pleaded guilty to a summons for diverting the supply of the Dawlish Electric Light and Power Co., Ltd. Mr. G. H. McMurtrie, who prosecuted, said that on December 3rd the company received a request from defendant's father for an electrician, as his dough-mixing machine had broken down. A man who was sent found the machine to be electrically perfect. He then examined the company's fuse box at the entrance to the property and discovered that an electric lamp was burning in the passage although the meter was not registering any consumption. Further examination revealed that the company's lead seal had been broken and that two wires had been connected to the company's fuse box, by-passing the meter.

The electrician found that the main service cable was not in its original position. It had been bent into a cavity made by the removal of a brick from the top of the wall, and when the electrician went to pull it out he found it had been bared and he received an electric shock. Two other wires joined the cable in the cavity and went underneath the floorboards of the bedroom above into a cupboard in an adjoining room, where they were connected to a switch. Wires from this switch passed beneath the floor of the main lighting circuit and further wires went into the storeroom. There were two separate systems of diverting electricity, and defendant could fully light his house and also drive a cake-mixing machine and other small appliances in the bakery without any registration. A considerable amount of engineering ingenuity was shown in the manner in which the wires had been installed by the defendant.

It appeared that the defendant's motive for "tapping" the main was that his father refused to allow him to run his plant off the normal supply. The system was tampered with first about nine months previously. As a result of the diversion the company estimated its loss to be £6 18s., which was increased to £10 8s. by the expense of the inspection and putting the meter in order. Had it not been for the breakdown in the dough-mixing machine the matter might have gone on for years.

Defendant's solicitor said that when the defendant was informed that the company had discovered a diversion he made a frank and complete statement. When he interfered with the lighting circuit it was not because of any malicious intent, but merely because he wanted to experiment with the lighting installation.

The Bench imposed a fine of £15, and ordered defendant to pay five guineas costs and three guineas advocate's fee.

Pentode Valve Patent Action

In the Chancery Division on January 27th Mr. Justice Morton had before him the action brought by the Mullard Radio Valve Co., Ltd., against British Belmont Radio, Ltd., Balfour House, Finsbury Pavement, E.C., on a motion on behalf of the plaintiffs for leave to amend the specification of the letters patent for a particular form of pentode valve. The defendant company did not appear on the present application.

Mr. Heald, K.C., for the plaintiffs, said it was an application by way of notice by the plaintiffs in a patent action for leave to amend the specification. The defendants, the British Belmont Co., did not appear as respondents to the application for leave to amend for a reason he (counsel) would later explain, but there were four respondents who did then appear as objecting to the proposed amendment. These were Electrical & Musical Industries, Ltd.; Marconi's Wireless Telegraph Co., Ltd.; Standard Telephones & Cables, Ltd.; and the Philco Radio & Television Corporation of Great Britain, Ltd.

The plaintiffs were the owners of letters patent No. 287958 dated December 24th, 1926, and on November 25th, 1933, they issued a writ against the Philco Corporation in an ordinary action for alleged infringement of their patent, claiming an injunction and damages. On March 6th, 1934, the plaintiffs issued a writ in a second action against the British Belmont Radio, Ltd., and another defendant. The pleadings were the same in both actions, and there were other actions similar against other defendants. It was decided that the decision in the Philco action would decide the other cases, and it was arranged that nothing was to be done in the other cases until the House of Lords had given judgment in the Philco action.

The House of Lords gave judgment in that case in June last year, and by that judgment the plaintiffs' patent was held to be bad, on the ground that their claim was too wide, and in the words of Lord Macmillan that "the patentee had over-reached himself," and therefore the plaintiffs failed in the action. There was in that action no counterclaim for the revocation of the plaintiffs' patent and the doctrine was that in these circumstances the patent might be good in part. Mr. Justice Farwell, who originally tried the action against the Philco Corporation in the Chancery Division and dismissed it, held that claim I of the plaintiffs' patent was valid and gave a certificate of validity. Two other claims of the patent were never discussed, and in these circumstances the plaintiffs, after the judgment of the House of Lords had been given, decided to avail themselves of the right to amend the specification.

Mr. Heald said that the action of the plaintiffs against British Belmont Radio, Ltd., had been settled subject to the determination of this present question of amendment.

Mr. Heald, on Monday last, dealt at great length with the highly technical details involved.

The case, which is proceeding, is expected to last several days as a number of expert witnesses are to be called by both parties.

Fire Discloses Electricity Fraud

At Oldham Police Court last week Owen John McNamee, Barrowshaw, an unemployed electrician, was summoned for fraudulently obtaining electricity, and alternatively for unlawfully disconnecting the meter. It was stated that on November 13th a fire at defendants' premises was reported. After the fire had been controlled, officials of the fire brigade and Electricity Department made an inspection and found that the electricity meter had been tampered with, as a result of which electricity could be obtained without its being registered.

Defendant said he did not dispute that he tampered with the meter, but he did not think that that caused the fire. The chairman of the Court said that defendant as an electrician must have known what he was doing. He was fined 40s.

"Voluntary" Electrical Workers

The First Division of the Court of Session, Edinburgh, on January 28th, gave judgment in an appeal under the National Insurance Act, 1924, by a Greenock woman against a decision of the Department of Health for Scotland. Appellant had claimed a widow's pension. Her husband was one of a number of men who were, in consequence of prevailing unemployment, in receipt of able-bodied relief from Greenock Corporation as Public Assistance Authority. The men were anxious to keep themselves fit by taking such work as was open to them, whether they were remunerated for it or not, and the Greenock Corporation arranged that they might be allowed to work in the Corporation Electricity Department. The Department of Health, among other facts, found it admitted or proved that the men employed were not treated by the Corporation as employés of the Electricity Department. They received no payment, but continued to be in receipt of relief. The men were known as voluntary workers.

Appellant's application for a pension was refused, the Department of Health holding in law that her husband, whilst working for the Electricity Department, was not employed under a contract of service, and was not employed within the meaning of the National Health Insurance Acts.

The First Division refused the woman's appeal. The Lord President said he was unable to find any contractual element at all between the man and the Electricity Department. There was no consideration paid by the Department; there was no control of the man in the sense that the Electricity Department had any legal ground to complain if he absented himself; nor in the event of that Department failing to provide work would the man, so far as his Lordship could see, have any right of action against the Electricity Department or the Corporation. His Lordship thought it was clear that the man was not working as a person employed within the meaning of the National Health Insurance Acts. For that reason, which he regretted, the appeal must fail. He would say, however, that the appellant's husband was deserving not only of all sympathy, but admiration, and that if he had seen legal grounds which would have enabled him to reach a conclusion in the appellant's favour, he would have been only too glad to do so.

Lords Moncrieff and Carmont concurred.

Alleged Electricity Theft Conspiracy

The means whereby dishonest consumers of electricity in Calcutta, Howrah and other places in British India, aided by men who made a practice of tampering with meters, stole considerable quantities of current from the Calcutta Electric Supply Corporation, were disclosed to the Judicial Committee of the Privy Council in the course of an appeal, the hearing of which ended on January 28th.

The appellants were Babulal Choukhani, a Calcutta cinema proprietor, who was stated to have been sentenced to one year's rigorous imprisonment and to pay a fine of one thousand rupees on conviction for theft of electrical energy, and Sailendra Nath Mukherjee, an ex-employé of the Supply Corporation, who received a sentence of two years' rigorous imprisonment on a charge of abetting him. They sought to have set aside a judgment of the High Court of Judicature at Fort William, Bengal, confirming the sentences which were passed upon them by the Chief Presidency Magistrate of Calcutta. The members of the Committee who sat to hear the appeal were Lord Wright (presiding), Lord Alness, Lord Romer, Sir George Rankin and Sir Shadi Lal.

It was explained that the Calcutta Electric Supply Corporation was led to suspect a leakage of some kind because, in 1933 and 1934, its officials noticed that the books showed a substantial discrepancy in the amount of energy generated, and the amount billed for. Transmission and distribution losses were by no means sufficient to account for the difference. Special inquiries were instituted, and a system of frequent meter readings was adopted. It was then found that, occasionally, certain meters registered a smaller total consumption of electricity when read on some dates than they had shown when read a week or so previously. Ultimately, a letter was received from a dismissed head constable who stated that he knew of arrangements made with the owners or occupiers of premises to have their electricity meters tampered with. He appended a list of establishments to his letter.

Twenty-three persons were afterwards charged with being parties to a criminal conspiracy to commit theft of electrical energy and among those who were finally brought to trial were the two appellants. The case put forward for the prosecution was that consumers of electricity, among them the accused, had entered into agreements to employ others, who had some technical experience of electrical matters, to tamper with the meters upon their premises. In some cases the individuals who did the tampering were paid a regular weekly sum for their services, and in others they shared "fifty-fifty" in the amounts by which the accounts for current supplied were reduced. The evidence indicated that the "tamperers" used to cut off the leaden seals which had been put on the meters by officials of the Supply Corporation, and after removing the glass casing they manipulated the hands of the indicators with their fingers. Everything was then replaced exactly as it had been before.

In one case, it was stated, an over-zealous manipulator failed to notice that he was operating upon a brand-new meter. The hands of the indicator all stood at zero when he began, but when he finished they all pointed to nine, which meant that the meter was registering the maximum consumption it was capable of registering. The role assigned by the prosecution to the appellant, Sailendra Nath Mukherjee, was that of a canvasser. That was to say, he was alleged to have made contacts, and to have concluded negotiations with consumers whereby they agreed to employ the "tamperers."

It was contended on behalf of both the appellants that the joint trial of all the accused was illegal, and that the proceedings were vitiated by misjoinder of persons. Mr. Carden Noad, for Babulal Choukhani, also submitted that there was no evidence to justify the conviction of his client. It would be a parallel happening to what had taken place in Calcutta, Counsel suggested, if the London police, having caught fifty cat-burglars committing cat-burglaries, singly or in small groups, in different parts of the metropolis, had brought them all up in court together, and charged them with conspiracy.

Mr. G. D. Roberts, K.C., for the Crown submitted that the form of the trial was quite legal, and that it was carried out quite properly in every respect.

Their Lordships reserved judgment.

Oil-engine Working Costs

In our reference to the working costs of heavy-oil engines (on page 56 of our January 14th issue) the average fuel consumption quoted, namely, 0.647 lb. per kWh generated, was for the total of 66 stations at home and abroad, not for 40 stations as stated. The lowest total engine cost at home for the year was 0.352d. per kWh (Crompton Parkinson, Ltd.).

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The British Industries Fair

The Advisory Committee for the Electrical Section has made the following arrangements for official visits to the Birmingham Section of the British Industries Fair by associations connected with the electrical industry :—

Tuesday, February 22nd (1 p.m.)—Luncheon.
Institution of Electrical Engineers (South Midland Centre).
Incorporated Municipal Electrical Association (Provincial Centres).
British Electrical Development Association (Provincial).
Association of Supervising Electrical Engineers.
Association of Steel Conduit Manufacturers.
Tramways, Light Railways & Transport Association.
Illuminating Engineering Society.
Electrical Contractors' Association, Inc. (Provincial).
Electrical Wholesalers' Federation (Provincial).
Association of Mining Electrical Engineers.

Thursday, February 24th (4 p.m.)—Tea.
Electrical Association for Women (Birmingham and Midlands Branch).

Saturday, February 26th (1 p.m.)—Luncheon.
Electrical Power Engineers' Association.
Electrical Association for Women (Demonstrators' Circles).

Saturday, February 26th (4 p.m.)—Tea.
Students' Section of the South Midland Centre of the Institution of Electrical Engineers.

Tuesday, March 1st (1 p.m.)—Luncheon.
Institution of Electrical Engineers (Council).
Incorporated Municipal Electrical Association (Council).
British Electrical Development Association (Council).
Incorporated Association of Electric Power Companies.
Provincial Electric Supply Association.
London Electricity Supply Association.
Electrical Contractors' Association of Scotland.
British Electrical and Allied Manufacturers' Association (Council).
Electrical Contractors' Association, Inc. (Council).
Electrical Wholesalers' Federation (Council).

Finchley and Electrical Contractors

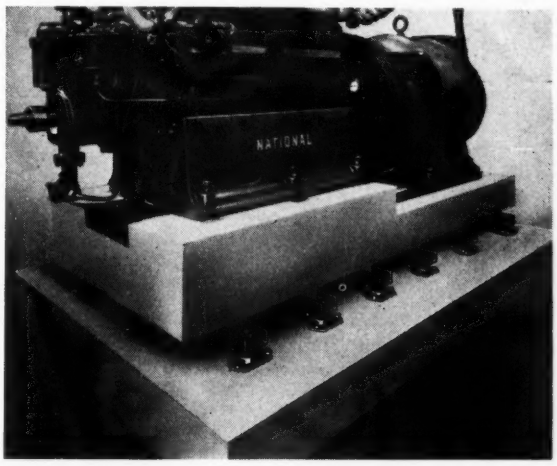
At a recent meeting of the Finchley Corporation Electricity Committee the general manager submitted a letter from the Electrical Contractors' Association regarding assisted wiring. The Committee recommended that all wiring work executed by contractors under the Council's development schemes should be confined to members of the E.C.A. occupying and operating from business premises within the borough.

West Yorkshire Contractors' Dinner

Speaking at the annual dinner of the West Yorkshire branch of the Electrical Contractors' Association in Leeds on January 28th, Mr. C. Nelson Hefford (city electrical engineer of Leeds) said that £700,000,000 in capital had been sunk in the electrical industry, and there were 400,000 people employed in it. It ranked fifth in importance among the country's industries, but one of these days it would be first. He looked forward to continued co-operation between publicly owned supply authorities and electrical contractors. The industry had passed through enormous development. Years ago the powers that be, as represented by Corporations, Councils and Committees, on the advice of their technical advisers, were able to a great degree to have the last word in matters affecting the industry, but that was not now the state of affairs. Parliament had come to recognise the importance to the nation of electricity supply, and as it invariably did with something successful had had to interfere. The Central Electricity Board had had to interest itself in the sale of electricity and had to sell enormously increased quantities in order to make some sort of equalised balance sheet.

Anti-vibration Mountings

Unusually severe requirements in the way of freedom from vibration or tremor recently called for foundations of a special nature for a National Diesel engine direct coupled to a 20-kW generator. The set is carried on a reinforced concrete raft which is moulded on the underside so that it rests securely in six steel channels. The outer ends of these are carried upon twelve "Silentbloc" anti-vibration mountings, consisting of rubber stretched between two concentric steel tubes and which, being in tension, does not deteriorate. No cement is used and the tubes are held firmly but flexibly, the engine and raft resting upon the inner tube, while provision is made for attaching the outer tube to the secondary base. Although these bearings are relatively small, they are capable of sustaining a far greater load than that imposed by this generating set, single mountings being now available for carrying 8 tons each.



A Diesel generating set carried on "Silentbloc" anti-vibration mountings

Wrought Iron Lighting Fittings

MacGregor & McCallum, of 1, Newman Street, W.1, who specialise in wrought-iron products, have recently opened new and more spacious showrooms situated in a new wing of the building. These showrooms are tastefully decorated in modern style, and special attention has been given to the display of lighting fittings. Of particular interest are the floor and table standards, wall brackets and pendant fittings, all supplied with candle units. These are shown in period wrought iron, with painted or antique iron finishes, and also in decorative woodwork. There is also a period fireplace of wrought iron fitted with an imitation coal fire. All the products shown are manufactured at the firm's own London factory.

The new showroom of MacGregor & McCallum

Portsmouth Wholesalers' Fire

A fire occurred on January 26th at the premises of Wall & Attwooll, Ltd., electrical and radio wholesalers, in Crasswell Street, Landport, Portsmouth. Considerable damage was caused to the stock and the premises. The company has opened temporary premises at 25-29, Hyde Park Road, and asks us to state that it will be pleased to receive six copies of manufacturers' lists for its own use, and a liberal supply of leaflets and other advertising material for distribution.

Electricity Supply in the North-East

At the present time, when attention is being directed towards the improvement of general amenities throughout the

country, the important part played by public utility undertakings is of interest, and with a view to making known what is being done in north-east England the North-Eastern Electric Supply Co., Ltd., has issued a booklet briefly outlining the growth of the company and its service to consumers in its area of supply. The literary matter is supported by a number of well-produced illustrations of some of the uses to which electricity is applied.

Australian Tariff Decisions

The following decisions respecting the application of the Australian Customs Tariff are among those which have been issued by the Commonwealth Department of Trade and Customs:—Testing appliances being a combined signal generator, oscillator and oscilloscope for use in connection with the testing of radio equipment and valves of the type used for wireless transmission for use in the manufacture of electrotherapy units, under security: British preferential tariff, duty free. Generator sets, motors, in which the shaft is common to both the motor and the d.c. generator: up to and including 20 kW 30 per cent. *ad valorem*; exceeding 20 kW free.

A College Installation

The Rotherham College of Technology and Art states that, even when on a 100 per cent. overload, no plug has overheated on the switchboard recently supplied them by Crompton Parkinson, Ltd. The College Electrical and Engineering Department designed the plug panels on both switchboards. That in the machine laboratory provides supplies from the mains (three-phase, 400 V), a d.c. generator, rectifier, d.c. low-voltage booster, battery charger, a d.c. battery, and variable-voltage a.c. supply from a tapped transformer to many points in the college building, and connects back into a small switchboard in the measurement laboratory. Ten different supplies can be passed through the board at the same time to twenty rooms in the college building. The small switchboard is used to give a supply by four different circuits to each bench in the measurement laboratory, the available supplies being three-phase, 50 cycles, 400 V; 150 V, three-phase, four-wire; single-phase, 230 V; 230 V d.c.; or any d.c. voltage from 2 to 54, this being obtained from a battery. Pilot lamps indicate which supply is being used. All the plugs were designed by Crompton Parkinson, using helical springs in the plug and solid brass sockets.

Southampton Docks

The Southampton Docks Handbook, 1938, which has just been published by the Southern Railway, is a complete guide to the accommodation and equipment at the Docks. Particulars are included of rates and charges in addition to a great deal of general information. The many illustrations include pictures of some of the large ships which dock at Southampton.

Sales representatives of J. H. Tucker & Co., Ltd., with their 1938 Standard "Nine" cars

The Manchester Electrical Circle

Mr. W. Forsyth, the secretary of the Manchester Electrical Circle, referring to our last week's note on a recent meeting, asks us to say that Mr. G. M. Brewster, who has been re-elected chairman of the Circle, is not a councillor as we stated in our report.

The James Lincoln Arc Welding Foundation

The competition organised by the James F. Lincoln Arc Welding Foundation has attracted so much attention in this country that a London office to further the work of the Foundation in England and to deal with inquiries has been opened at Thames House, Millbank, London, S.W.1 (telephone: Victoria 1426). The British secretary of the Foundation is Mr. R. Butler.

A Topical Window Display

The accompanying illustration of a topical window display at the showrooms of the Nottingham Corporation Electricity Department, was arranged to "tie-up" with the local showing of the film "Knight Without Armour," and, as will be seen, was used for advertising Hotpoint circulators.

KNIGHT WITHOUT ARMOUR
IN DAYS OF OLD WHEN KNIGHTS WERE BOLD
THEY BATHED IN WATER OR SO COLD
BUT KNIGHTS TO-DAY WITH PLEASURE MAY
BATH IN THE
Hotpoint
ELECTRIC WAY.
SEE THE FILM 'KNIGHT WITHOUT ARMOUR'
THIS WEEK at the HIPPODROME
with DONAT & DIETRICH

A Hotpoint display at the Nottingham Electricity Department's showrooms

Electrical Commercial Travellers

The annual dinner of the Electrical Trades' Commercial Travellers' Association, was held on Friday last at the Connaught Rooms, W.C.2, Mr. C. W. Boyce (chairman), presiding. The toast of "The President" was proposed by Mr. E. L. Joseph, and Mr. L. Gamage, in responding, said that the travellers had organised to help each other, and the Association deserved the support of the industry. Although they had increased their membership during the past year, the total was still only 250, and members should try to get other commercial travellers to join. In proposing the toast of "The Association and its Charities," Mr. A. W. Beuttell said that the Association was one which conferred all kinds of benefits upon the commercial electrical traveller and he mentioned some of its benevolent and social activities. Travellers could, he said, obtain substantial assistance from the Association which could not be obtained through any other source. The number of commercial electrical travellers in the country had been variously estimated at between 5,000 and 10,000; it seemed, therefore, that the Association's present membership of 250 was not nearly the number that was desired. He urged members to do their best to get others to join, and suggested that during the coming year each member should obtain at least one new member. Mr. E. A. Joyce, who responded, appealed for their generous financial support of the Association's charities and mentioned that their president, Mr. Gamage, had made a donation of £100 to their death benefit fund. The toast of "The Visitors" was proposed by Mr. D. J. Hughan, Mr. M. T. Wood responding. Mr. E. North proposed the toast of "The Chairman and Officers," to which Mr. Boyce suitably replied. During the evening a sum of £19 15s. was collected for the Association's charities.

Scottish Street Lighting Conference

Representatives of a number of local authorities in South Scotland attended a conference on street lighting organised by E.D.A. and held in Edinburgh on January 25th and in Glasgow the following day. Mr. E. C. Lennox, the chairman, urged that the lighting of highways should be a national responsibility. Except for certain notable exceptions, the development of our highways had not kept pace with the large traffic increase, and they welcomed the expenditure of money provided by motor vehicle taxation for the improvement of these highways. But was it generally realised that the greatest number of accidents occurred during hours of darkness? The number of accidents during hours when artificial lighting was necessary was such that the accident rate at night was calculated to be five times as great as by day. The amount of traffic was less, but otherwise road conditions were the same. There could be only one main factor contributing to this position—lack of visibility. Either speeds at night must

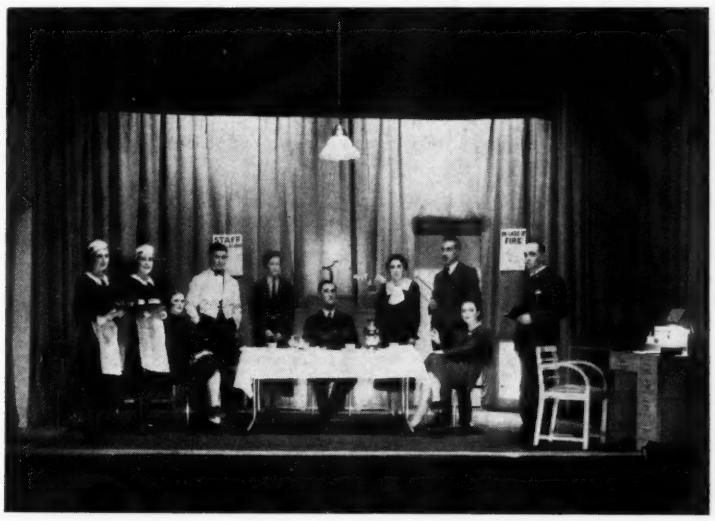
be reduced by law or legislation must be introduced to increase the visibility by the provision of adequate and properly installed street lighting. Proof of the benefits of good street lighting was already forthcoming. On one two-mile stretch of highway the night accident rate per annum had been reduced by 40 per cent. since the introduction of improved street lighting. Street lighting should no longer be considered a parish charge. Lighting which would provide adequate visibility and a safeguard against accidents was of equal importance to any other road maintenance charge, and it should not be the responsibility of small and relatively poor parishes to provide lighting on either trunk roads or other main highways when the majority of traffic came from the larger cities and did not contribute to local rates. The problem was now one for future legislation, and it seemed necessary to interest Members of Parliament in the subject, making the street lighting of highways a service financed by national funds and controlled by competent street lighting engineers. "The New Era in Street Lighting" was the subject of a lecture by Mr. W. T. le Marechal, in which recent developments of the tungsten filament and electric-discharge lamps were outlined. Mr. R. Maxted spoke on "Modern Street Lighting," and "The Economics of Street Lighting" was discussed by Mr. H. C. Babb, M.I.E.E., general manager of the Lothian Electric Power Co.

Greek Electrical Import Proviso

A notice recently issued by the Greek Ministry of Communications provides that importers of electrical appliances must submit samples and drawings to the electrical laboratory of the Ministry for inspection and approval.

Social Events

J. B. Priestley's comedy of detection "Mystery at Greenfingers," was admirably presented by the newly-formed dramatic society of L. G. Hawkins & Co., Ltd., last week, at the Twentieth Century Theatre. The cast possesses considerable acting ability and tribute must be paid particularly to Helen Fordham, as "Edna Sanders," for a spirited performance, Tommy May handled the long part of "Robert Crowther" with ability, a remark which also applies to Doris Appleby as "Miss Tracey." Other members of the cast were Charles Breton, who made an excellent French chef, Wilfred Perkins, Elsie Garrard, Alice Ashcombe, Olive Evans, Lilian Collyer, and Arthur Schaverien. Credit for the natural production, which went without a hitch, was due to Mr. Charles Breton, the producer.



A scene from "Mystery at Greenfingers," presented by the Dramatic Society of L. G. Hawkins & Co., Ltd.

About sixty members of the London staff of Callender's Cable & Construction Co., Ltd., with two from Belvedere and two from the Anchor Works, attended the annual dinner for ex-Servicemen, held at Anderton's Hotel, Fleet Street, on January 28th. Mr. T. O. Callender presided, supported by Messrs. C. W. Clarke and G. H. T. Petersen, and the retiring honorary secretaries, Messrs. W. S. Crick and F. W. Hills. At a meeting held after the dinner it was decided to form an organisation to include ex-Service employés at London, Belvedere and the Anchor Works, and all offices and branches. Mr. W. Eagles (London) was elected hon. secretary.

Orders Recently Booked

A contract has been secured by Richardsons, Westgarth & Co., Ltd., from the Douglas Corporation (Isle of Man), for the construction of a large water tube boiler and a number of auxiliaries for the new Douglas power station.

An order to supply an automatic telephone exchange serving 3,600 subscribers at Haifa, Palestine, has been received by the General Electric Co., Ltd. The plans provide for an ultimate extension to 8,000 lines. This installation will replace a manual exchange supplied by the G.E.C. several years ago and since extended. In addition to the automatic equipment, a manual switchboard will be installed at which sixteen operators will give trunk calls on demand. Power will be provided by a Witton motor-generator set, with 600-A output at 57-V, and an engine-generator set will serve as a standby. The equipment will also include two batteries, each with a present capacity of 2,500 Ah, the sets being charged and discharged alternately. This will be the third large automatic exchange manufactured by the G.E.C. for Palestine. The others, at Jerusalem and Tel-Aviv, each have 3,500 lines and will shortly be ready for service. There is also to be a small automatic exchange at Bethlehem. The Haifa Bay exchange installed a short time ago will operate in conjunction with the new Haifa equipment.

The Monometer Manufacturing Co., Ltd., has recently delivered a further 3-ton capacity "Monometer" dual-valve cable furnace for the continuous feeding of lead extruding presses to Pirelli General Cable Works, Ltd., Eastleigh, Hants.

Murex Welding Processes, Ltd., has recently completed an order for the Admiralty for eight 51-kW, ten-operator, self-contained motor generator sets. The generators are of the compound-wound type, output 925 A at 55 V, falling to 50 V on open circuit. Provision is made to enable an open-circuit voltage of 60 to be obtained by shunt control when necessary. The motors are three-phase, squirrel-cage machines, built in the same frame as the generators. George Ellison starters are fitted, of the auto-transformer type with no-volt and three overload releases, and "Cirscale" instruments by the Record Electrical Co. have been provided in order to obtain a long open scale. The specification stipulated that there should be no interference between welders striking or breaking an arc between no load and full load, and by special design of the units this requirement has been met.

Trade Announcements

Mosseri, Curiel & Co., Ltd., Emad-El-Din Street, Cairo, Egypt, have been appointed agents for the Brush Electrical Engineering Co., Ltd., in Cairo, Egypt, and will handle Brush Diesel engines, homogenisers, rolling stock, bus and coach bodies, &c.

Mr. H. M. Fulton, mechanical and electrical engineer, has removed to 300, Swanston Street, S.E.

The Birmingham office of the United Steel Companies, Ltd., has been removed to Union Chambers, Temple Row, Birmingham (telephone: Midland 6321).

Quick Repairs to a Cable Press

A few months ago cracks appeared in the head of a hydraulic press belonging to one of the largest cable manufacturing concerns in this country. The situation became one of extreme urgency when, a few days later, the head of a second press split in two. The weight of each head is nearly 15 tons and the fractures were through metal varying in thickness from 3 in. to 5 in. The dual breakdown immediately held up the production of the largest size of cable. Welding was suggested and Barimar, Ltd., were called in. This company reported that it could make a satisfactory repair of both heads, and it was decided to put the work in hand at once on the site. Work proceeded on both heads simultaneously and by the employment of relays of operators the work continued night and day. It was found possible to weld the head that was only cracked without removing it from the body of the press. More than a ton of welding material was used on the heads. The means employed have been fully justified, not only in the complete success of the results, but because of the substantial saving on the cost of new parts. The speed with which these repairs were completed was of the utmost importance to the owners, because it enabled them to fulfil contracts in hand within the time allotted, whereas had it been necessary to procure new heads a delay of many weeks must have ensued. The repair to the split head is one of the largest welding repairs ever carried out in this country.

Tenders for South Africa

The Federation of British Industries has had its attention drawn to the necessity for British firms tendering for South African Government and Railway contracts to dispatch their tenders in ample time to reach the Tender Board before the closing date. The Tender Board's regulations make provision for the consideration of tenders received after the closing date, but only if the Board is satisfied that the tenderer had taken all reasonable steps to allow for ordinary delays and was otherwise in no way to blame for the late delivery of his tender. This ruling does not allow the consideration of tenders received after the closing date in the posting of which due allowance has not been made for the variable transmission times (8 to 12 days from London to Durban and Johannesburg) which may elapse between the day of posting and the day of delivery. The Post Office has recently published the latest day of posting for the mid-weekly dispatch and the Federation has urged that the date for the week-end dispatch should be published also. Meanwhile, it is recom-

mended that the maximum allowance for transmission should be made in respect of letters containing tenders.

Irish Electrical Imports

Imports of electrical goods and apparatus into Eire during 1937 were valued at £1,212,300, an increase of nearly £100,000 over the previous year. The most notable increase was in imports of telegraph and telephone apparatus, which last year were valued at £101,633 as compared with £45,874 in 1936. During the year large-scale improvements were carried out in the country's internal and external communication systems, and work was also begun on the erection of a new short-wave transmitter. Government intervention by way of tariffs to protect the home industry resulted in the imports of electric lamps falling from £50,086 in 1936 to £24,729 last year. Imports of electrical machinery, apart from motors, rose from £211,844 to £247,630. The following table shows the values of the various electrical imports during the two years under review :—

	1936	1937
	£	£
Electrical machinery :		
Motors	53,131	56,064
Other sorts, not enumerated separately	211,844	247,630
Dry batteries, complete	17,216	18,039
Dry batteries, parts of	4,254	4,479
Electric lamps	50,086	24,729
Electric lighting accessories, fittings and parts	81,893	82,953
Electric wires and cables, insulated	98,734	98,031
Telegraph and telephone apparatus, n.e.s.	45,874	101,633
Wireless apparatus :		
Broadcast receivers, fully manufactured	111,796	118,232
Radio gramophones, fully manufactured	3,079	2,608
Other sorts, fully or substantially assembled	10,360	11,900
Component parts and accessories	118,704	114,203
Other electrical goods and apparatus	312,149	331,199
Total	£1,120,120	£1,212,300

Practical Electrician's Pocket Book

The 1938 edition (the fortieth) of the "Practical Electrician's Pocket Book" (*Electrical Trading*, 2s. 6d. net, 2s. 10d. post free), which has recently been published, has been thoroughly revised. One of the most important changes is in the section on wiring installation which has been completely rewritten by Mr. T. C. Gilbert. New subjects are low temperature heating and water heating, with various reference tables. The uses, repair and maintenance of portable electric tools receive special attention, and there is also new matter on automatic lighting plant, installation of neon signs, the application of time-switches and the features of the new fluorescent lamps. Dr. A. P. M. Fleming again summarises the past year's progress of the electrical industry and there are eighty-four pages of tables of supply voltages in over 7,000 districts in Great Britain and Ireland.

Courses for Technical Teachers

With the co-operation of the Metropolitan-Vickers Elecl. Co., Ltd., the Board of Education is making arrangements for short courses for teachers of engineering subjects to be held from July 6th to 13th at the works of the company at Trafford Park, Manchester. The courses will be conducted by Mr. H. S. Shelley, assisted by members of the Met.-Vick. staff, and will be open to instructors in recognised technical colleges and schools and junior technical schools in England and Wales. There will be no admission fee, but applications on a prescribed form must be made by March 31st. Further information, including particulars of travelling allowances, are given in Form 105 U (T1), obtainable from the Secretary of the Board of Education.

Local Exhibition

An exhibition of locally manufactured electrical goods is now in progress at the showrooms of the Preston Corporation Electricity Department. Among the exhibitors are: The English Electric Co., Ltd. (domestic apparatus); E. Dewhurst, Ltd. (poultry equipment, &c.); Siemens Electric Lamps & Supplies, Ltd. (various types of lamps); Nelson & Co. (Preston), Ltd. (domestic and commercial water heating and cooking apparatus); Ensign Lamps, Ltd. (various types of lamps); S. Parker & Co. (Preston), Ltd. (commercial fish and chip ranges, potato peelers and water heaters).

Prices of Materials

Henry Gardner & Co., Ltd., report February 2nd: Copper bars (best selected), sheet and rod, no change. English pig lead, £18, 5s. increase. Spelter, £14 12s. 6d., 2s. 6d. increase. English block tin, £180 15s., 5s. increase.

Edward Till & Co. report February 2nd: India-rubber, Para fine, no change.

"Isco" Publicity

W. T. Henley's Telegraph Works Co., Ltd., has adopted a novel form of publicity in connection with its new all-insulated "Isco" fuse boxes with replaceable cartridge fuses. With a folder giving a brief technical description, a letter is being sent to which a personal touch is given by adding the name of the addressee to the printed heading, "Here's something you've been waiting for ——." The folder also bears the recipient's name matched in with the design.

Welding Electrodes

The increasing use of electric arc welding has resulted in the production of a large number of electrodes which are distinguished by names or numbers. A booklet has now been issued by Murex Welding Processes, Ltd., which has been compiled to assist in the selection of the correct electrode and also provides useful information regarding the correct methods of application and procedure.

Agencies Required

Mr. R. E. Jeffries, of R. E. Jeffries & Co., Sydney, Australia, is on a visit to this country to attend the British Industries Fair, and while he is here he wishes to secure agencies from manufacturers, not represented in Australia, of electrical machinery, instruments, electric motors, insulating materials, switchboard material, electric clocks, fans, machines for the manufacture of insulated staples, copper wires, and high temperature heating elements. His address during his stay in England will be c/o Nathan & Allen, Ltd., 131, Victoria Street, S.W.1.

Dutch Electrical Imports and Exports

From the official Dutch trade returns for the past year we have compiled the appended tables showing the imports into and exports from Holland of electrical machinery and allied material during 1937 as compared with the preceding twelve months from which it will be seen that both branches experienced a marked increase, the imports having advanced to the extent of £1,152,971, or over 42 per cent. and the exports by £2,822,162 (over 52 per cent.). For purposes of comparison, the gross value of the imports and exports in sterling, at 8.95 guilders to the £ has been added.

		IMPORTS.		EXPORTS.	
		1936. 1,000 Guilders.	1937. 1,000 Guilders.	1936. 1,000 Guilders.	1937. 1,000 Guilders.
Electric generators and parts	Tons	667	1,218	148	502
Electric motors weighing under 11 lbs.	No.	66	160	14	14
Electric motors weighing over 11 lbs.	„	822	1,776	637	1,298
Parts of motors	Tons	284	436	50	151
Radio appliances and parts	„	7,918	9,128	34,437	52,654
Telegraph and telephone apparatus and parts	„	3,432	5,197	283	320
Electric vacuum cleaners	No.	803	948	116	290
Incandescent lamps	„	483	596	5,586	7,377
Other electric lamps	Cwt.	28	38	379	1,127
Insulated wire and cables	Tons	2,425	3,683	1,575	3,626
Bulbs for electric lamps	„	90	165	1,293	1,461
Electric locos and vehicles	„	68	286	6	9
Electric cycle lamps	No.	921	1,129	70	143
Dynamos and parts for ditto	—	117	209	15	65
Electric refrigerators	No.	317	424	6	10
Electrical instruments and other goods	—	5,932	9,489	3,386	4,212
Total Guilders	—	24,413,000	34,732,000	48,001,000	73,259,000
Totals at 8.95 Guilders to £	—	£2,727,700	£3,880,671	£5,363,201	£8,185,363

New Catalogues and Lists

The Phosphor Bronze Co., Ltd., 54, St. Thomas Street, London, S.E.1.—A leaflet dealing with phosphor bronze in electrical plant.

Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, London, W.C.2.—A pocket price list of motors and control gear.

Batwin Electric Motors, Ltd., 138, Southwark Street, London, S.E.1.—A leaflet dealing with the company's flexible-shaft unit.

Strong & Co., 12-13, Hamsell Street, London, E.C.1.—An illustrated catalogue of electric lamps of all kinds.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A leaflet illustrating starter switchboards.

Griffin & Tatlock, Ltd., Kemble Street, London, W.C.2.—Technical specifications of a new laboratory muffle furnace and new drying oven.

Graham Farish, Ltd., Bromley.—A leaflet giving details of the company's floodlight reflectors.

British Insulated Cables, Ltd., Prescot.—Leaflets dealing with copper, bronze, and cadmium copper tapes and binders and "Thiokol" sheathed cables.

Baker Platinum, Ltd., 52, High Holborn, London, W.C.1.—A 24-page technical booklet dealing with applications of precious metals in the electrical industry.

Major Equipment Co., Ltd., 162, Millbank, London, S.W.1.—A 70-page illustrated catalogue of theatre and cinema lighting equipment, including lamps, projectors, dimmers, &c.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A booklet describing pneumatic collecting and conveying systems.

Sun-Vic Controls, Ltd., 1, Kingsway, London, W.C.2.—A technical illustrated booklet dealing with temperature control and hot-wire vacuum switches.

British Klöckner Switchgear, Ltd., 21, Richmond Place, London, S.W.8.—A beautifully illustrated 78-page book describing installations of the company's switchgear in both rural and city areas.

Private Arrangements

W. E. Hutchison, electrical engineer, 21, Park Lane, Cardiff.—The creditors met on January 20th at the offices of Poppleton & Appleby, 35, Windsor Place, Cardiff. The statement of affairs showed ranking liabilities of £2.106, and in addition there was a fully secured creditor for £263. The net assets were £48, leaving a deficiency of £2,058. It was stated that the debtor had been in the electrical trade for very many years. Recently, however, the business had suffered owing to his ill-health. It was suggested that the debtor should be granted a moratorium with a view to endeavouring to set aside monies out of the trading to pay a composition to the creditors, and it was decided that the debtor should be allowed time in which to submit an offer.

A. L. Stuart, wireless dealer and engineer, 480, Anlaby Road, Hull.—A meeting of the credtiors was held on January 27th at Hull when the statement of affairs showed ranking liabilities of £2.249. The net assets were £411, leaving a deficiency of £1,838. A resolution was passed in favour of a deed of assignment being executed to Mr. W. B. Hall, of National Provincial Chambers, Silver Street, Hull, with a committee consisting of the representatives of Marconiphone Co., Ltd., G. Gilbert & Co., Ltd., and Hillman Bros., Ltd.

Bankruptcy Proceedings

G. Linds, electrical contractor, 4, Red Lion Street, Holborn, W.C.—The first meeting of creditors was held on January 25th at London Bankruptcy Buildings. Mr. S. W. Hood, Official Receiver, reported that the debtor had stated that he commenced business in 1937 as an electrical contractor and retailer with a capital of £138. His limited capital debarred him from buying in the best markets, and he purchased stock which he was unable to sell. Creditors pressed in December, and the landlord distrained for £34; he removed goods valued at £60, and nothing was left. The debtor estimated his liabilities at £300, and in the absence of assets the case was left in the hands of the Official Receiver to be wound up in bankruptcy, the failure being attributed to trade depression, heavy family expenses, and insufficient capital.

D. Freeman, 54, Whitchurch Gardens, Edgware, Middlesex, radio dealer.—The first meeting of creditors in this case was held on January 27th at the London Bankruptcy Buildings. The Official Receiver reported that the liabilities amounted to £797, according to the statement of affairs submitted by the debtor, and there were no assets. No details regarding the debtor's trading, &c., were given at the meeting and the case was left in the hands of the Official Receiver.

L. T. Wilson, 30, Yardley Road, Acocks Green, Birmingham, formerly carrying on business at 563, Coventry Road, Birmingham, radio and electrical engineer.—At the public examination held on January 26th at the Court House, Corporation Street, Birmingham, debtor said his failure was due to lack of capital, insufficient turnover to provide for expenses, and unreliable employés. His statement of affairs showed a deficiency of £156 on ranking liabilities of £210. The examination was provisionally closed.

H. P. Ansell, electrical consultant, 6, Daines Close, Thorpe Bay, trading in partnership with others as H. P. Ansell & Partners, and as Engineering Services, First Avenue House, High Holborn, W.C.—Receiving order made January 25th on debtor's own petition.

J. R. L. Allen, radio dealer, lately residing and trading at 51, Chigwell Road, South Woodford, and also lately trading at 68, Clapham Road, London, S.W.—Receiving order made January 21st on a creditor's petition. Public examination March 9th at Carey Street, W.C.2.

G. Thorne, radio dealer, The Bungalow, Kittle Green, Bishopston, Swansea, lately trading at 40, Singleton Street, and 162, Port Tennant Road, Swansea.—Receiving order made January 24th on debtor's own petition.

L. A. W. Steinmetz, electrical dealer, 56, Bromham Road, Bedford.—Last day for receiving proofs for dividend February 11th. Trustee, Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver.

J. V. Barke, radio manager, 27, High Street, Ruislip.—Last day for receiving proofs for dividend February 14th. Trustee, Mr. J. B. Simmons, 3, Forbury, Reading, Official Receiver.

P. A. Manley, radio dealer, 136, Ashton New Road, Manchester.—First and final dividend of 1d. in the £, payable February 9th at the Official Receiver's Office, Byrom Street, Manchester.

J. W. Colleer, radio dealer, 3, Heybridge Street, Heybridge, Maldon, Essex.—Public examination March 2nd at the Shire Hall, Chelmsford.

F. F. C. King, radio trader, 235, Banbury Road, 55, High Street, 37, St. Aldates, and 226, Cowley Road, Oxford.—Public examination February 28th at the County Hall, Oxford.

J. T. Southwood, electrical engineer, 13, Brandreath Road, Compton, Plymouth, lately trading at Belgrave Garage, Mutley, Plymouth.—First meeting February 4th at 11, St. Aubyn Street, Devonport, Plymouth. Public examination February 25th at The Western Law Courts, Plymouth.

A. F. Webb, electrician, Ashdown, Regent's Road, St. Helens, Lancs, formerly trading at 102, Duke Street, St. Helens.—Last day for receiving proofs for dividend February 9th. Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool.

R. C. Marshall (Northern Service Depôt), radio dealer, 318, Stretford Road, Manchester.—First and final dividend of 4s. in the £, payable at 47, Mosley Street, Manchester.

R. H. Bullough (Hyson Radio), radio, electrical and cycle dealer, 72, Gregory Boulevard, Nottingham.—First and final dividend of 2s. 3½d. in the £, payable February 8th at 22, Regent Street, Park Row, Nottingham.

W. F. Hurry (Bijou Portable Radio Co.), 157, Junction Road, Highgate, N.19.—Application for discharge to be heard on February 24th at Carey Street, W.C.2.

G. L. Branford, radio and electrical engineer, 68, Margate Road, Ramsgate.—Last day for receiving proofs for dividend February 16th. Trustee, Mr. F. C. Wells, 1, The Parade, Canterbury, Official Receiver.

Company Liquidations

Goldhawk Electric Co., Ltd., 375, Westway, Western Avenue, Shepherd's Bush, electrical, mechanical and wireless engineers.—The first meetings of creditors and shareholders under the compulsory liquidation were held on January 20th at Carey Street, W.C., before Mr. H. P. Naunton, Senior Assistant Official Receiver. A statement of affairs was submitted showing unsecured debts of £2,302 and debentures of £400, against assets valued at £1,135. The issued capital of the company is £286. The failure of the company was attributed to mismanagement and to cable manufacturers not allowing wholesale sellers' discounts, amounting to £420. A further cause alleged was the inaccessibility of the company's premises. A resolution was passed for Mr. A. E. Attwood, accountant, to act as liquidator with a committee of inspection.

Cornish Electricity Companies.—The following companies are being wound up voluntarily and Mr. E. J. Harrison, 11, Waterloo Place, S.W.1, has been appointed liquidator:—West Cornwall Electricity Supply Co., Ltd.; Penzance & District Electric Supply Co., Ltd.; Truro Electricity Supply Co., Ltd.; Callington & District Electric Supply Co., Ltd.; Camborne Electricity Supply Co., Ltd.; Newquay Electric Light & Power Co., Ltd.; Launceston & District Electric Supply Co., Ltd.; East Cornwall Electricity Supply Co., Ltd. Particulars of claims to the liquidator by February 25th.

These electricity undertakings were formerly controlled by the Urban Electric Supply Co., Ltd., and have been transferred by that company to the Cornwall Electric Power Co.

Electric Tubular Heating Co., Ltd.—Meeting February 28th, at 15, Eastcheap, E.C.3, to receive an account of the winding-up by the liquidator, Mr. R. Mountstephen.

Automatic Electrical & Mechanical Controls, Ltd.—Meetings February 28th, at 115-117, Cannon Street, E.C.4, to receive an account of the winding-up by the liquidator, Mr. G. C. Jarvis.

Dissolutions of Partnership

Rees & Young, radio dealers, electrical and cycle engineers, 72, High Street, Nantyffyllon, and 123, Oxford Street, Pontycymmer.—Messrs. D. L. Rees and C. R. Young have dissolved partnership. Mr. Young will attend to debts and carry on the business at Oxford Street, Pontycymmer.

Ball Bros., radio relayers, 20, Bank Street, Rawtenstall.—Messrs. W. L. Ball and J. Ball have dissolved partnership. Mr. W. L. Ball will attend to debts and carry on the business.

Indian Electrical Imports

A SURVEY of the import trade of India during the first six months of the fiscal year (April 1st to September 30th, 1937), prepared for the Department of Overseas Trade by H.M. Senior Trade Commissioner in India, shows that the total value of trade in electrical instruments, apparatus, appliances and parts registered an important advance from Rs.138.7 lakhs in the corresponding period of 1936 to Rs.175.9 lakhs. The bulk of the trade was enjoyed by United Kingdom manufacturers, who also secured a major part of the advance, their share rising from Rs.77.6 lakhs to Rs.91.1 lakhs. Germany, the next largest supplier, sent shipments valued at Rs.26.9 lakhs (against Rs.19.6 lakhs), the United States sent a total of Rs.20.6 lakhs (Rs.19.6 lakhs), and Japan came fourth with Rs.12.5 lakhs (Rs. 7.1 lakhs).

An analysis shows that although the imports of electric fans and parts increased in value from Rs.15.8 lakhs to Rs.18.4 lakhs, the United Kingdom's share decreased from Rs.10.9 lakhs to Rs.9 lakhs, Italy increasing its supplies from Rs.0.5 lakhs to Rs.3.9 lakhs. There was also a marked improvement in the imports of electric wires and cables from Rs.42.2 lakhs to Rs.55.6 lakhs, largely secured by the United Kingdom, which increased its shipments from Rs.29.5 lakhs to Rs.40.2 lakhs. The imports of rubber insulated electric wires and cables shared in the general improvement, increasing from Rs.13.8 lakhs to Rs.19.7 lakhs, mainly as a result of an advance in the shipments from the United Kingdom. The imports of electric wires and cables with insulations other than rubber, also registered an advance, the United Kingdom again being the principal supplier with Rs.22.9 lakhs (against Rs.15.9 lakhs). There was a contraction in the imports of telegraph and telephone wires from Rs.2.8 to Rs.1.4 lakhs, but the United Kingdom practically maintained its position, its share being Rs.1.3 lakhs. There was an improvement in the imports of telegraph and telephone apparatus from Rs. 9.3 lakhs to Rs.11.3 lakhs, secured entirely by "other countries," the U.K. share remaining almost stationary at Rs.8.4 lakhs.

The imports of gas-filled electric lamps expanded from Rs.8 lakhs to Rs.9.7 lakhs, but the increase was due to larger exports from the Netherlands (from Rs.0.9 lakh to Rs.1.8 lakhs) and from "other countries" (from Rs.1.2 lakhs to Rs.2 lakhs), the share of the United Kingdom remaining stationary at Rs.5.5 lakhs. The import trade in vacuum electric lamps also increased from Rs.5.2 lakhs to Rs.9.5 lakhs. Japan displaced the United Kingdom as the principal supplying country, its share rising from Rs.0.9 lakh to Rs.3 lakhs. Imports from the United Kingdom rose from Rs.2.4 lakhs to Rs.2.6 lakhs.

The total trade in batteries increased from Rs.12.6 lakhs to Rs.14.9 lakhs. Over 60 per cent. of this trade was enjoyed by the United States, but the share of the United Kingdom improved slightly from Rs.0.4 lakh to Rs.0.6 lakh. The trade in electric lighting accessories and fittings, including switches, expanded from Rs.3.4 lakhs to Rs.4.5 lakhs, the increase in the supplies from the United Kngdom being from Rs.1.8 lakhs to Rs.2.1 lakhs. Germany, however, doubled its share from Rs.0.7 lakh to Rs.1.5 lakhs. The imports of electric meters were practically stationary at Rs.5.9 lakhs, of which the United Kingdom secured Rs.2.8 lakhs and Germany Rs.1.8 lakhs. The value of electro-medical apparatus (including X-ray apparatus) imported showed a considerable increase, rising from Rs.1.7 lakhs to Rs. 3.2 lakhs.

The trade in complete radio receivers rose from 9.275 receivers, valued at Rs.8.6 lakhs, to 11,721 receivers, valued at Rs.10.4 lakhs. The largest proportion of this trade as regards quantity was secured by the United States, which sent 6,154 receivers (against 5,839), but its share in value was less at Rs.4.5 lakhs (against Rs.5.2 lakhs). The share of the United Kingdom increased appreciably from 1.263 receivers, valued at Rs.1.5 lakhs, to 2,135 receivers, valued at Rs.2.9 lakhs. The trade in radio valves increased slightly from Rs.0.6 lakh to Rs.0.63 lakh, the United States again obtaining the largest share. Imports from the United Kingdom rose from Rs.0.26 lakh to Rs.0.28 lakh.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—CHANGE-OVER.—Plans have been approved by the Electricity Committee for a change-over from d.c. to a.c., involving an expenditure of £75,978. The scheme includes additions to the 6,600-V switchgear at the Ferryhill generating station, which will be necessary to control the supply to be provided under the scheme for extending the distributing system. Of the total expenditure, £61,598 represents the estimated cost of the new plant. The existing 6,600-V switchgear is housed in three chambers on the Millburn Street site of the turbine room, and as no further space is available there for extensions it will be necessary to begin developments on a fresh site. The proposed scheme involves placing the new switchgear in two switch-houses to be built in the Department's yards at Clayhill. Provision will be made for taking into each switch-house a supply from the grid or other external source should it be desirable and available. Twelve outgoing feeders from each switch-house will run to various sub-stations in the supply area.

Barking.—STREET LIGHTING.—Class "D" illumination is to be provided in Ripple Road at an estimated cost of £1,035.

NEW CABLES.—The Electricity Committee is to lay high-voltage cables from Erkenwald Road to Bowes Road, and erect a sub-station in Stamford Road. The total cost is estimated at £17,400.

Bedford.—SUB-STATION.—A sub-station is to be erected in Duck Mill Lane.

Bideford.—RURAL SUPPLIES.—The Electricity Commissioners have requested the Bideford and District Electric Supply Co., Ltd., to consider preparing a combined scheme for the provision of an electricity supply for Beaford and High Bickington.

Blackpool.—ILLUMINATIONS DEPARTMENT TO CONTINUE.—The Corporation has agreed to continue the Autumn Illuminations Department as a separate body with a separate departmental head for a further twelve months.

Burnley.—CHANGE-OVER.—Permission is being sought by the Electricity Committee to borrow £25,000 to meet anticipated expenditure on the change-over from d.c. to a.c.

Cardiff.—HIRE-PURCHASE SCHEME.—A new hire-purchase scheme has been introduced and the chief electrical engineer (Mr. E. Jones) has been empowered to determine the period of hire-purchase within a limit of six years with varying rates of interest according to the period approved. Any domestic appliance may be purchased and free maintenance is given by the Corporation throughout the period, except in the case of vacuum cleaners.

Coventry.—MAINS AND PLANT.—The Electricity Committee is applying for permission to borrow £4,684 for mains and plant.

Cuba.—CONTROL OF PRIVATE ELECTRICAL SYSTEMS.—A recent Government decree sets out the regulations which are to apply to the installation of privately owned electrical systems in Cuba. The rules provide for the official control of all mechanism and material used for the generation, distribution and utilisation of electrical energy, except in the case of a public utility system. A permit from the Department of Public Works must be obtained before any electrical installation or modification can be carried out.

Czechoslovakia.—ELECTRICAL DEVELOPMENT.—Details recently published of the extent of electrical usage indicate that some 11,400,000 of the 15,000,000 inhabitants are now supplied with electricity. In Moravia and Silesia 90 per cent. of the total population is provided with electricity, and in Bohemia the proportion is 88 per cent. Slovakia and Ruthenia are less developed.

Darlington.—LOAN.—The Town Council is to borrow £15,000 for sub-stations and equipment and £7,378 for switchgear and reactors. Application is being made for permission to borrow £25,194 for additional expenditure in connection with extensions to the generating station.

Dartford.—NEW E.H.V. CABLE.—The Electricity Committee is to lay an 11,000-V feeder from the electricity works to Temple Hill.

Erpingham (Norfolk).—RURAL SUPPLIES.—The East Anglian Electric Supply Co., Ltd., is being asked by the Rural District Council when it intends to supply electricity to Edgefield, Plumstead, Hempstead and the remainder of Sidestrand.

Finchley.—LIGHTING.—Improvements in the street lighting costing £4,190, are to be carried out by the Electricity Committee.

SUB-STATION.—The Committee is to build a sub-station at the junction of the Barnet By-pass Road and the North Circular Road.

Lindsey.—HOSPITAL IMPROVEMENTS.—The County Council has approved an estimate of £2,200 for the replacement of the telephone system and the installation of electric clocks at the Bracebridge Mental Hospital.

Fort William.—SPECIAL ORDER.—The Fort William Electricity Special Order has been confirmed by the Ministry of Transport.

Frome.—RURAL SUPPLIES.—The Wessex Electricity Co. proposes to afford a supply of electricity to Buckland, Dinham and Great Elm.

Heckmondwike.—LOWER "ALL-IN" CHARGES.—The Electricity Committee has reduced the charges for electricity under the "all-in" system as from the quarter commencing April 1st next, as follows:—Annual fixed charge of 15 per cent. of net rateable values not exceeding £50 and where the net r.v. exceeds £50, 10 per cent. of the excess, plus a "unit" charge of ½d. for all electricity consumed, both charges to be subject to a discount of 2½ per cent. for prompt payment.

Jarrow-on-Tyne.—STREET LIGHTING.—Application is to be made by the Town Council for sanction to borrow £1,400 towards the cost of lighting York Avenue with sodium lamps.

Liverpool.—METERS.—The Electric Power and Lighting Committee is applying for powers to borrow £50,000 for new meters. Sanction has been obtained to a loan of £100,000 for sub-station equipment.

London.—POPLAR.—The Electricity Committee is seeking permission to borrow £30,000 for the replacement of consumers' apparatus, including wiring, necessitated by the change-over from d.c. to a.c.

Long Eaton.—In connection with the proposed bulk supply from the Derbyshire & Nottinghamshire Electric Power Co. as from April 1st, application is being made by the Urban District Council for sanction to a loan of £6,000 to purchase the necessary converting plant and switchgear.

Luton.—SUB-STATION.—The Electricity Committee is to erect a sub-station in Dudley Street, Leighton Buzzard.

Manchester.—ELECTRICITY FOR SANATORIUM.—The Corporation proposes to install electricity at Baguley Sanatorium, at a cost of £3,500.

LOANS.—Sanction is being sought by the Electricity Committee to a loan of £200,000 for service mains and £20,000 for street lighting.

New Zealand.—SHORTAGE OF POWER.—The capacity of the Taumaranui Borough Council's plant is insufficient to cope with the rapidly increasing load, and until the Government's supply from Arapuni is available (probably May, 1938) certain restrictions will have to be enforced, states the *N.Z. Electrical Journal*. At a recent meeting of the Borough Council it was decided not to undertake to provide any further all-electric houses at present.

EXTENSION OF WORK.—Extensions involving an expenditure of approximately £22,000 are at present being made to the Nelson City Council's generating station and supply scheme, for the purpose of connecting the power house with the Waimea Power Board's Diesel standby station at Stoke, and at the same time making provision for receiving power from the Cobb hydro-electric scheme at a later date. The work includes the erection of an 11,000-V overhead line, laying of underground cables, and extensions to the power station building for the installation of new equipment. A decision to approach the Government for a grant to reticulate Waiheke Island was reached at a recent meeting of residents. The residents have been informed by the Auckland Power Board that the cost of erecting a generating plant at Onetangi would be too much, and also that it would be at least ten years before the Board would lay a cable from the mainland to the island.

Oxford.—SUPPLY IN THE OUTER AREA.—Last week the City Council confirmed its offer of £300,000 for the purchase of the undertaking of the Oxford Electricity Co., Ltd., which serves the outer area of the city. It also decided to ask the Electricity Commissioners not to allow the Wessex Electricity Co. to purchase the undertaking of the Oxford Co. for a sum above that already sanctioned unless it agrees to offer at once and in the future in the area concerned exactly the same tariff and charges for hire, street lighting and conditions of service as in the Corporation's area. The decision of the Oxford Co. last Friday to sell its undertaking to the Wessex Co. is reported in our City section.

Rawtenstall.—MAINS.—Application is to be made by the Electricity Committee for sanction to borrow £20,000 for mains.

Scotland.—SPECIAL ORDER.—It is announced that the Electricity Commissioners have submitted to the Minister of Transport a Special Order made by them on the application of the Grampian Electricity Supply Co. for the supply of electricity within an area including Dornoch and parts of Creich, Rogart, Clyne, Loth, and Kildonan; also in the parishes of Tain, Edderton, and Kincardine in the County of Ross and Cromarty.

Sheffield.—POWER STATION EXTENSIONS.—Approval has been given to the following estimates: Blackburn Meadows generating station, buildings, civil engineering works, plant, &c., for a second 50,000-kW plant, £646,640; further development of the 33-kV switchgear system, £84,441; multi-core cable gallery, £1,150; extension of 11-kV switchgear, £2,850.

MAINS.—The Electricity Committee is to extend its mains at a cost of £10,248.

Shipley.—POWER PLUGS IN COUNCIL HOUSES.—A recommendation has been passed by the Housing Committee that a plug should be fitted in each of 433 Council houses.

LOAN.—Sanction is being sought by the Electricity Committee to borrow £5,788 in connection with the extension and improvement of the electricity supply for the operation of trolley-buses on the Bradford and Keighley Road.

Stalybridge and District.—ASSISTED WIRING.—The Stalybridge, Hyde, Mossley and Dukinfield Joint Transport Electricity Board, after discussing with electrical contractors the increased prices of materials used in the assisted-wiring scheme No. 7, has decided to agree to an increase of 15 per cent. in the contractors' charges. The period for repayment by consumers under the scheme is to be extended from seven to eight years.

Sunderland.—REDUCED HIRE CHARGES.—The hire charges for electric cookers are to be reduced by 1s. per quarter and for boilers by 6d. per quarter. Electrically operated fish-frying ranges are to be supplied on the hire-purchase system by the Corporation.

EXTENSION SCHEME.—The Electricity Committee has recommended an £8,000 scheme for extending the electricity works in Dunning **Street.**

Tynemouth.—SMALL REFRIGERATORS.—The electrical engineer recently reported to the Electricity Committee that there was a demand for smaller refrigerators than those at present sold and that to meet this Frigidaire, Ltd., was prepared to supply a 2-cu. ft. type at £23 2s. (retail), provided the Committee agreed to become an "installing trader" and purchase two refrigerators for showroom and demonstration purposes. The hire-purchase terms would be 1s. 11d. per week for five years. The company was willing to provide sales support and to attend to after-sales service and also bear the whole responsibility for the five-year warranty. The offer of the company was accepted.

Tynemouth.—CABLE-LAYING.—New cables are to be laid by the Electricity Committee near Preston North Road and Rakehouse Lane for supplies to buildings under construction.

West Bromwich.—SUB-STATION.—The Electricity Committee has purchased land at Gorse Farm estate for the erection of a sub-station.

MAINS.—Sanction is being sought by the Electricity Committee to borrow £30,000 for mains.

Wigan.—STREET LIGHTING.—The Lancashire Electric Power Co., Ltd., is preparing a public lighting scheme for the Robin Hood district.

Wimbledon.—DISTRIBUTION EQUIPMENT.—The Electricity Committee is to lay supplementary cables and replace existing cables at a total estimated cost of £13,065. Proposed new sub-stations and alterations and additions to existing sub-stations are estimated to cost £25,341.

Wisbech.—CHANGE-OVER.—The Wisbech Electric Light & Power Co., Ltd., has applied for consent to alter the supply to consumers in the borough from d.c. to a.c.

Wolverhampton.—ELECTRICAL DEVELOPMENT.—The Town Council has accepted a recommendation of the Electricity Committee involving an expenditure of £48,343 to meet increased demands.

Traction

Australia.—SURVEY OF STREET TRANSPORT.—Some months ago Mr. G. R. Steer, general manager of the Brisbane Tramways and Power House Department, visited Sydney, Melbourne and Adelaide to discuss the latest developments in public street transport and the reasons for the changes made, particularly in connection with trolley-bus services recently opened, and he has now submitted a report. He found that the Kogarah (Sydney) trolley-bus service opened last July had resulted in a steady increase of about 30 per cent. in traffic as compared with the former steam trams. The district was very suitable for such a service, but the financial results would be affected by the fact that twenty-one vehicles had to be provided to cope with the peak-hour traffic, although during the slack periods only three were needed. In Melbourne the Metropolitan Tramways Board was satisfied that trams were more efficient for routes carrying heavy traffic, and where they were not justified it preferred the mobility of motor buses. In Adelaide a trolley-bus service was opened last September on the Tusmore-Adelaide route, part of which had previously been operated by motor-buses. The through journey of 4¼ miles cost 4d. the same as on the Brisbane trams for a like distance. Trolley-buses were also to be operated from Adelaide to Port Adelaide, and there would be extensions to Largs and Semaphore, making 15½ miles in all. The tram service to Port Adelaide was abandoned in 1935 and the inauguration of the trolley-bus service would not, therefore, involve the scrapping of valuable plant. Moreover, the route chosen could not have been more favourable, and Mr. Steer considers that there is nothing comparable in Brisbane. As a result of the tour he is satisfied that at Brisbane they should rely on trams, assisted by motor- or trolley-bus services where the volume of traffic is not sufficient to warrant the construction of new lines. Either motor- or trolley-buses, for instance, will probably be adopted over Story Bridge and to St. Lucia, where a university is to be erected. In the year ended June 30th last, the Tramways Department made a profit of £16,764, passenger-journeys increasing from 82.6 to 86.1 millions. At the end of the period the mileage of single track was 105.

London.—ELECTRICALLY OPERATED TICKET MACHINES.—The London Passenger Transport Board has placed an order amounting to £125,000 for ticket selling equipment. All the busiest stations in Central London are to be equipped with ticket-and-change machines, and three hundred have been ordered. At the same time all old-fashioned pull-bar machines will be withdrawn and replaced by electrically worked slot machines. The ticket office equipment of central area stations will be improved by the installation of 135 larger capacity printers. The rest of the order is for equipment that will be needed under the £40,000,000 programme.

Portsmouth.—PROPOSED REORGANISATION OF TRANSPORT FACILITIES.—A proposal to reduce the number of routes operated and to cut down the number of trolley-buses running on certain other routes is contained in the report of the general manager. The undertaking is faced with meeting the expenditure on the introduction of the trolley-bus service, and at the same time it has certain outstanding commitments on the old tramway system. Several of the routes have always been run at a loss, and others pay only in the summer months. It is felt that any further increase in fares would defeat its own object. If the proposals are adopted, it is estimated that £10,000 will be saved.

It is expected that the first trolley-bus route in Belfast will be inaugurated at the end of this month. The accompanying picture shows a vehicle on a trial run on the upper section of Falls Road

Salford.—MORE BUSES TO REPLACE TRAMS.—Following the recent decision of the Transport Committee to substitute motor-buses for trams on the Manchester to Winton *via* Eccles Old Road route, it has now been resolved to deal similarly with the route from Manchester to Peel Green *via* Eccles Old Road. The Cromwell Road to Peel Green *via* Eccles New Road route is also to be converted, but trams will continue to run as far as Weaste.

United States.—TROLLEY-BUSES INCREASE REVENUE.—Instances of trolley-buses restoring transport systems which were working at a loss to profitable operation are quoted in *Electrical News and Engineering*. In 1931 the Shreveport Railways system was faced with the necessity of making radical changes if the company were to remain in business. Five trolley-coaches were introduced and these increased revenue so rapidly that the number of coaches has since been increased to forty-four. Passenger-journeys are double what they were in 1931 and the company is now operating at a profit. Five years ago the Indianapolis Railways system was patronised only by those who had no other means of transport. The company undertook a programme of modernisation, introducing 152 trolley-coaches, with the result that the net operating revenue in 1936 was 108 per cent. more than in 1932. At Portland, Oregon, passenger-journeys have increased by 25 per cent. since trolley-coaches were introduced in 1935.

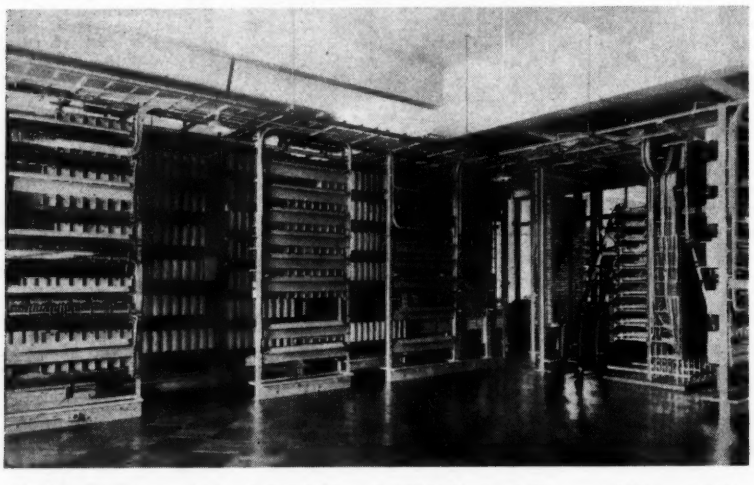
Wirral.—ELECTRIC TRAINS IN MARCH.—The London Midland and Scottish Railway Co. announces that electric traction will come into operation on March 14th, on its Wirral Section lines. Conversion of this section to electric operation includes the routes from Birkenhead Park to West Kirby and New Brighton, the total route electrified amounting to a little over 10 miles. An important feature of the scheme is to be the introduction of through electric train services between both West Kirby and New Brighton and Liverpool (Central) Low Level, in conjunction with the Mersey Railway Co. At present passengers from Wirral stations to Liverpool or *vice versa* have to change at Birkenhead Park, and the introduction of through services will mean quicker and more convenient travelling. The journey times will be 29 min. from West Kirby to Liverpool and 20 min. from New Brighton; a 10-min. service will be given during business hours and approximately a 15-min. service at other times. Electric services will operate for a "dress rehearsal" on Sunday, March 13th, in order to afford an opportunity for the staff and the travelling public to become acquainted with the altered methods of operation on a day when business travel is not a primary consideration. In preparation for the electric train service the company has had built nineteen three-car train sets of the most modern construction, each seating 141 third- and 40 first-class passengers; during the peak hours, however, the trains will be composed of six cars. Features of these new trains include the use of light high tensile metals, and the provision of air-

operated sliding doors to save time at stations. The electrification, which has been carried out under the Government Loan Guarantee Schemes of the Railways (Agreement) Act, 1935, is on the third-rail system at 650 V. The Mersey Railway Co., which is to provide certain of the through services between Liverpool (Central) and the Wirral lines, has modernised some of its trains for this purpose, and has also installed four new high-speed electric lifts at James Street Station, Liverpool. Extensive alterations to the track arrangements at Birkenhead Park, in order to facilitate through running, are nearing completion, and a number of the L.M.S. Wirral Section stations are in course of modernisation.

Communications

Argentina.—MUNICIPAL RADIO.—The Deliberative Council has authorised the City of Buenos Aires to purchase a radio transmitting installation of 50 to 60 kW. The price is not to exceed 710,000 pesos paper.—*Review of the River Plate.*

Great Britain.—RADIO-TELEPHONE LINK WITH SCILLY ISLES.—A new radio-telephone service between the mainland and the Scilly Isles was inaugurated last week. An exchange named "Scillonia" and a radio station have been established at St. Mary's, the largest of the Scilly islands, and a second radio station has been opened on the mainland near St. Just.



Automatic switch racks, subscribers' meter rack and intermediate distribution frame at the Bangrak exchange, Siam

Similar projects are in hand for linking the Hebrides and the Shetland Isles with the mainland.

TELEVISION PROGRESS.—In the House of Commons, on Tuesday, the Postmaster-General, answering a question regarding the television service, said that in spite of difficulties, considerable progress had been made during the first year of the television service, and a high degree of efficiency had now been reached, both technically and on the programme side. In the meantime, the prices of receiving sets had been reduced and many types of sets were now on sale which were thoroughly reliable and simple to manipulate. A Sunday television service was about to be introduced; the week-day hours were to be extended; and every effort was being made to provide programmes of an interesting and attractive type. In addition, he had decided, on the recommendation of the Television Advisory Committee, that the present technical standards of transmission from the Alexandra Palace station should remain substantially unaltered for at least three years, and the public might therefore purchase television sets without any fear that they would become obsolete or require substantial alteration for a very considerable time to come. Great Britain was the first country to establish a public television service, and it was still the only country in which television could be received in the home. He was confident of the future of the service.

Siam.—AUTOMATIC TELEPHONY.—Two automatic dial telephone exchanges—Wat Lieb and Bangrak—have been installed in Bangkok for public service. They have been equipped by the General Electric Co., Ltd., of England, and are for 2,300 and 1,200 subscribers, respectively. The authorities are contemplating the extension of both exchanges to give them a 50 per cent. increase in capacity, or the installation of two new exchanges, sites for which have been provisionally selected. A comprehensive scheme to operate the automatic system throughout Siam, in both city and country areas, is being discussed. The two exchanges are equipped with some 3,500 uni-selectors and 1,200 two-motion selectors, all automatic in their action, and about 3,500 meters for registering subscribers' calls. Power is derived from accumulator cells (in duplicate) which have a capacity at Wat Lieb of 1,300 Ah and at Bangrak of 882 Ah. The charging machines comprise motor-generator sets running off the supply mains and with an output in each case of 390 A at 57 V. The G.E.C. also supplied the telephone instruments, which are of the self-contained type (with the bell incorporated in the bakelite moulding) and specially designed for service in the tropics.

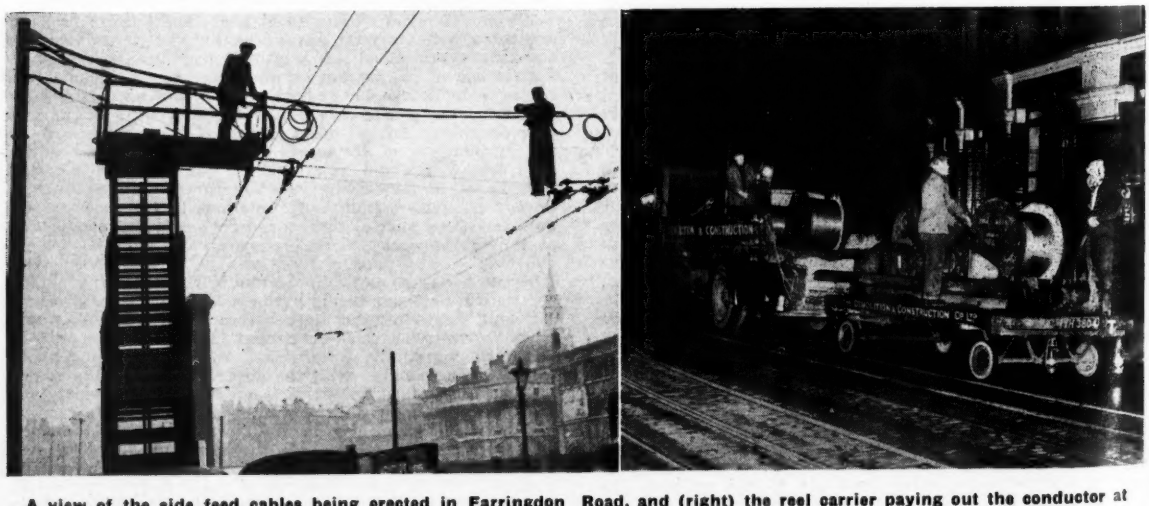
Overhead Equipment for London Trolley-buses

THE work of erecting a further thirteen route miles of trolley-bus overhead equipment for the London Passenger Transport Board has nearly been completed by the Demolition & Construction Co., Ltd., which also carried out a similar contract for the Board in 1936 at Leyton and West Ham, involving a twelve-mile route.

In the present scheme are included the routes from the Manor House junction to Tottenham Court Road, Holloway depôt to Holborn, and the "Nag's Head" to Smithfield. The contract covers junctions, turning circles and curves. About 1,500 poles have been erected and the entire reconstruction has had to be carried through without interference with the tramway services in a somewhat congested area.

The accompanying photographs, obtained by courtesy of the London Passenger Transport Board, show the nature of the work involved and the difficult traffic conditions.

At the present time there are altogether 218 miles of route in the L.P.T.B. area either converted or being converted to trolley-bus operation. The Board has also obtained powers for the conversion of the remaining 130 miles of tramway route making, with seven miles of new route, a total of 355 miles of route eventually to be operated by trolley-buses.



A view of the side feed cables being erected in Farringdon Road, and (right) the reel carrier paying out the conductor at the Smithfield turning circle [*Elec. Rev. photos.*

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Argentina.—BUENOS AIRES.—February 14. Sanitation Works Department. Electric deep well pumps. (T. 23748/37.)*

Australia.—MELBOURNE.—February 22nd. Deputy Director, Posts and Telegraphs. L.c. cable. (T. 16641/38.)*

Barry.—February 19th. U.D.C. Electric bells, lamps and conduits for twelve months. E. R. Hinchcliff, surveyor, Council Offices.

Beckenham.—February 21st. Electricity Undertaking. Stores for one year. (January 28th.)

Bexley.—February 11th. Electricity Department. Switchgear, kiosks, transformers, cable and transformer kiosks with fusegear. (January 28th.)

Birkenhead. — February 14th. Electricity Department. Lamps, switchgear and transformers for twelve months. (January 28th.)

Blackburn.—February 28th. Electricity Committee. Cable, wire and meters for twelve months. (See this issue.)

Blackpool.—February 10th. Electricity Department. Meters for twelve months. (January 28th.)

Bristol.—February 7th. Electricity Department. 6.6-kV and 11-kV transformers. (January 21st.)

March 4th. Port Authority. Two 1½-ton electric travelling portal cranes for Fry's Wharf, Canon's Marsh. Secretary, 19, Queen Square (deposit £3).

Cardiff.—February 4th. R.D.C. Electricity Department. Stores for twelve months. (January 21st.) Electric wiring under assisted wiring scheme for one year. H. Jackson, electrical engineer and manager, 20, Park Place (deposit £1 1s.).

February 14th. City Electricity Department. Meters and cables for one year. (January 21st.)

February 14th. Switchgear for twelve months. (January 28th.)

Cheadle and Gatley.—February 14th. Electricity Department. Materials for twelve months. (January 28th.)

Chichester.—February 11th. R.D.C. Electrical goods for twelve months. Clerk to the Council, Pallant House.

Clitheroe.—February 12th. Electricity Department. Materials for one year. (January 28th.)

Derby.—February 14th. Electricity Supply Department. Domestic apparatus control equipment. (See this issue.)

Dewsbury.—February 9th. Corporation. Electric wiring of 376 houses on the Corporation Overthorpe housing site. Thornhill. Town Clerk, Town Hall.

Ebbw Vale.—February 9th. Electricity Department. Rotary convertor plant, together with transformer, starting gear and d.c. panel. (See this issue.)

Edinburgh.—February 9th. H.M. Office of Works. Installation of electric lighting, &c., at new Government buildings. H.M. Office of Works, 122, George Street (deposit £1 1s.).

Egypt.—CAIRO.—March 2nd. Ministry of Public Works (Mechanical and Electrical Department). Two aircraft warning light installations. (T.Y. 17043/38.)*

Erith.—February 28th. Electricity Department. Meter testing equipment. (See this issue.)

Felixstowe.—February 21st. Electricity Department. Two 250-kVA transformers (6,000/415/240 V). (See this issue.)

Fife.—February 5th. County Council. Electrical and heating installation at temporary buildings at Viewforth Higher Grade School, Kirkcaldy. G. Sandilands, county master of works, Kirkcaldy (deposit £1 1s.).

Gloucester.—February 14th. Electricity Department. Meter testing instruments. (See this issue.)

Great Yarmouth.—February 24th. Borough Council. Materials for twelve months. (January 28th.)

Heston and Isleworth.—February 7th. Electricity Department. Cables, e.h.v. switchgear and transformer. (January 28th.)

Hove.—February 18th. Electricity Department. Materials for twelve months. (See this issue.)

India.—NEW DELHI.—March 4th. Indian Stores Department. Table standards, wires, shades, lampholders, lamp locks, &c., for one year. (T. 16825/38.)*

April 26th. Wall plugs and sockets, ceiling roses, &c. (T.Y. 16826/38.)*

Kettering.—February 25th. Electricity Department. Cables and meters for one year. (See this issue.)

Kingston-upon-Thames.—February 7th. Electricity Department. Stores for twelve months. (January 21st.)

Leeds.—February 19th. Electricity Department. 3-phase switchgear for Whitehall Road generating station. (January 21st.)

February 16th. Stores for one year. (January 28th.)

Littleborough.—February 19th. Electricity Department. One 500-kVA, three-phase transformer, one two-cubicle, 11,000-V switchboard, one l.v. switch cubicle, one l.v. metering and neutral panel and one distribution pillar. (See this issue.)

London.—H.M. OFFICE OF WORKS.—February 4th. Installation of electric lighting and power at Staffordshire House, Store Street, W.C. (January 21st.)

HACKNEY.—February 23rd. Electricity Department. Cables and flexible cords. (January 28th.)

HAMMERSMITH.—February 23rd. Electricity Department. Switchgear and transformers. (See this issue.)

STOKE NEWINGTON.—February 16th. Electricity Department. Stores for one year. (See this issue.)

Long Eaton.—February 19th. Electricity Department. Meters, cutouts and cables for twelve months. (See this issue.)

Manchester.—February 7th. Waterworks Committee. Plant at Longford Bridge, Stretford: Four sets of electrically driven vertical spindle centrifugal pumps, two 200-kW mercury arc rectifiers with transformers, and one 20-kVA auxiliary transformer. Deputy engineer, Waterworks Offices, Town Hall (deposit £1 1s.).

February 7th. Electricity Committee. Traction batteries. (January 28th.)

Middlesex.—The County Council invites applications from contractors for the addition of their names, as from June 1st, to the County Council's approved list of contractors for the installation of electric lighting and power, X-ray apparatus, refrigerators, electric lifts, cooking and laundry equipment, &c. (See this issue.)

Morecambe and Heysham.—February 10th. Electricity Department. Meter testing equipment. (See this issue.)

Newcastle-on-Tyne.—February 8th. Health Committee. Two sets of deep therapy X-ray apparatus. (January 21st.)

New Zealand.—WELLINGTON.—March 10th. Posts and Telegraph Department. One motor generator set. (T. 17071/38.)*

Oxford.—February 9th. City Council. Electrical installation for new police headquarters at St. Aldates. (January 28th.)

Perth.—February 21st. Corporation. Two sets of glass-bulb mercury rectifiers, complete with switchgear transformers and automatic control gear. (See this issue.)

Plymouth.—February 5th. Electricity Department. Meters, time switches, underground cables and joint boxes. (January 21st.)

Salford.—February 16th. Electricity Department. Stores. (January 28th.)

February 23rd. Cookers, fires, water heaters, wash boilers, kettles, switches and fuse boxes. (See this issue.)

Southampton.—February 15th. Electricity Department. Transformers, switchgear and cables. (January 28th.)

February 18th. Transformer kiosks, switchgear, cables, stores and materials, domestic apparatus and meters. (See this issue.)

South Africa.—PRETORIA.—February 10th. Union Tenders and Supplies Board. Cables. (T. 16235/38.)*

Spenborough.—February 17th. Electricity Department. Meter testing equipment. (See this issue.)

Stoke-on-Trent.—February 9th. City Electrical Engineer's Department. Stores for twelve months. (January 21st.)

Sutherland.—March 5th. County Council. Electric lighting at a new school at Golspie. County clerk, County Offices, Golspie.

Walton and Weybridge.—February 14th. Electricity Department. Materials for two years. (January 28th.)

Warrington.—March 8th. Visiting Committee. Heating and electrical installation and kitchen equipment for County Mental Hospital, Winwick. (See this issue.)

Wednesbury.—February 12th. Borough Council. Installation of electric wiring and fittings in 310 houses in Crankall Lane and Park Lane, and also four houses and shops. A. Booth, borough architect and surveyor.

West Riding.—County Council. Lighting installation at Oxspring Council School. Divisional Clerk, Education Offices, Penistone.

Wimbledon.—February 4th. Electricity Department. Transformers. (January 21st.)

February 7th. Three 11,000-V metal-clad switchboards and l.v. switchgear equipments, with air-break circuit-breakers. (January 21st.) Cables for twelve months. (January 28th.)

Winchester.—February 14th. Electricity Department. Underground cables for twelve months. (January 21st.)

Wolverhampton.—February 8th. West Midlands J.E.A. Underground cables. (January 21st.)

February 18th. Borough Council. Materials and equipment for twelve months. (January 28th.)

February 7th. Education Committee. Electric lighting at Springfield Road Schools extensions. H. B. Robinson, borough engineer, Town Hall (deposit £1 1s.).

Worcester.—February 26th. Electricity Department. Cables, conductors, transformers and meters for twelve months. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birmingham.—Electricity Committee. Accepted. Boiler for Hams Hall power station (£98,000).—International Combustion.

Education Committee. Accepted. Electric lighting installation at the Ridpool Road Junior and Infants' School (£790).—Gordon Hughes Electrical Co.

Durham.—County Education Committee. Accepted. Overhauling the electrical installation at the Langley Park Infants' School (£72).—R. Robson.

Ilford.—Electricity Committee. Accepted. Transformers (£520 and £530 each).—Ferranti, Ltd., and British Electric Transformer Co.

London.—ST. PANCRAS.—Electricity Committee. Four a.c. motors and auxiliary equipment (£343).—Fuller Electrical & Manufacturing Co.

POPLAR.—Contracts Committee. Recommended. Conversion of boilers from pulverised fuel to stoker firing (£20,206).—Inter-

national Combustion. Two motors (£419).—Met.-Vick. Electrical Co. Four motors (£442).—Brook Motors.

London.—L.C.C. Electrical installations in about 780 houses and flats at Becontree:

	£		£
Newman and Watson. Accepted...	**7,052**	F. H. Wheeler & Co.	7,824
Holliday and Son (Electrical) ...	7,165	City Electrical Co.	8,046
Ilford Electrical Co.	7,424	Springvale Electrical Co. ...	8,077
Rylands Electrical Co.	7,471	Read and Partners	8,303
Samuel Reed and Sons	7,758	Electrical Installations	8,369
Evans and Shea	7,777	Pinching and Walton	8,636

Lancaster.—Town Council. Accepted. Completion of wiring in houses on the Scotforth and Main Street estates (£207).—F. Mashiter. Completion of the wiring in houses on the Greaves estates (£40).—E. Caton & Sons.

Liverpool.—Water Committee. Recommended. Switchgear, transformers, cables, conduits, fixings and fittings in Nos. 1 and 2 Mersey Crossings at Randles Sluices (£848).—McGoff and Vickers.

Electric Power and Lighting Committee. Recommended. Fuel pulverising plant (£6,000, less an allowance of £2,050 for four pulverising mills to be dismantled).—Babcock & Wilcox.

Newcastle-on-Tyne.—City Council. Accepted. 50,000 yd. of electric trolley wire (£2,800).—B.I. Cables.

Salford.—Electricity Committee. Recommended. 15,000-kVA transformer (£5,242).—Yorkshire Electric Transformer Co. Rectifier (£250).—Hewittic Electric Co.

Sheffield.—Electricity Committee. Accepted. 50,000-kW alternator for Blackburn Meadows power station (£201,607).—Met.-Vick. Elect. Co. Boiler plant (£233,000) and concrete cooling-tower (£38,958).—Mitchell Engineering. Metering equipment (£1,133).—Ferranti. Switchgear (£1,600).—A. Reyrolle & Co.

Transport Committee.—Accepted. Traction motors.—Met.-Vick. Elecl. Co. Traction resistances.—E.M.B. Co.

Warrington.—Cleansing Committee. Accepted. Two electric vehicle batteries.—Chloride Electrical Storage Co.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, February 10th. Grosvenor House, W.1. 7 for 7.30 p.m. Annual dinner.

Meter and Instrument Section.—Friday, February 4th. Institution, London, W.C.2. 7 p.m. "An Objective Noise-Meter for the Measurement of Moderate and Loud, Steady and Impulsive Noises." Mr. A. H. Davis. "The Circuit Noise-meter (Psophometer) and its Applications." Mr. H. R. Harbottle.

Sheffield Sub-Centre.—Friday, February 4th. Annual supper-dance.

North-Eastern Centre.—Monday, February 7th. King's College, Newcastle-on-Tyne. 6 15 p.m. Informal Meeting with Students' Section. "Question and Answer."

South Midland Centre.—Monday, February 7th. James Watt Memorial Institute, Birmingham, 7 p.m. "Safeguards against Interruptions of Supply." Messrs. H. W. Clothier, B. H. Leeson and H. Leyburn.

Tuesday, February 8th. Chamber of Commerce, Birmingham. "Electrical Services to Large Buildings." Messrs. C. G. A. MacDonald and F. C. Carter. (Joint meeting with the Institution of Post Office Electrical Engineers.)

Scottish Centre.—Tuesday, February 8th. Royal Technical College, Glasgow. "The Moving-Coil Voltage Regulator." Mr. E. D. T. Norris.

East Midland Sub-Centre.—Tuesday, February 8th. The College, Loughborough. 6.45 p.m. "Safeguards against Interruptions of Supply." Messrs. H. W. Clothier, B. H. Leeson and H. Leyburn.

Hampshire Sub-Centre.—Wednesday, February 9th. Municipal College, Portsmouth. 7.30 p.m. "The Post Office Speaking Clock." Messrs. E. A. Speight and O. W. Gill.

Dundee Sub-Centre.—Thursday, February 10th. University College, Dundee. 7.30 p.m. "Recent Transformer Developments and Applications." Mr. T. A. Long.

Electrical Power Engineers' Association.—(*London Local Group*).—Tuesday, February 8th. Caxton Hall, Westminster. "Thermal Insulation in Theory and Practice." Mr. J. S. F. Gard.

Kent Section.—Saturday, February 5th. Royal Star Hotel, Maidstone. 6.30 p.m. "H. F. Actadis System." Mr. H. Purslove Barker.

Devon and Cornwall Section.—Saturday, February 12th. Queen's Hotel, Torquay. Annual dinner and dance.

Faraday House Old Students' Association.—Tuesday, February 8th. Hotel Great Central, Wharncliffe Rooms. 8 p.m. Annual dance.

Institution of Post Office Electrical Engineers.—Tuesday, February 8th. Savoy Place, W.C.2. 5.30 p.m. "Properties and Testing of Dielectrics." Messrs. J. F. Doust and W. J. Sulston.

Illuminating Engineering Society.—Tuesday, February 8th. Storey's Gate, St. James's Park, S.W.1. 7 p.m. Discussion on the Final Report of the M.O.T. Committee on Street Lighting, to be opened by Dr. J. W. T. Walsh.

Institution of Heating and Ventilating Engineers.—Wednesday, February 9th. Storey's Gate, St. James's Park, S.W.1. 2.30 p.m. "Engineering Equipment of Earls Court Exhibition." Messrs. O. Faber and J. R. Kell.

Park Lane Hotel, London. 6.30 for 7 p.m. Annual dinner.

Electrical Association for Women (Inc.).—Wednesday, February 9th. 20, Regent Street, S.W.1. 3 p.m. Annual general meeting.

Diesel Engine Users' Association.—Wednesday, February 9th. Connaught Rooms, London, Annual dinner.

Electrical Engineers' Ball.—Friday, February 11th. Grosvenor House, Park Lane, W.1.

British Electrical and Allied Industries Research Association.—Friday, February 11th. Savoy Hotel, London, W.C.2. 12.45 for 1 p.m. Annual General Meeting.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday, February 12th. Queen's Hotel, Cardiff. 7 p.m. Annual dinner.

Notes

The Electricity Bill

In the House of Commons, on February 1st, Mr. Ede asked the Prime Minister when it was proposed to give a first reading to the Bill for the reorganisation of the distribution of electricity. Mr. Chamberlain said that the time of the House would be very fully occupied in the coming weeks and he was not in a position to say when the Bill would be presented. Perhaps the hon. member would repeat his question in a month's time.

Mr. Ede: "Does that mean that the right honourable gentleman does not expect to pass the Bill this Session?—Mr. Chamberlain: "The answer does not say that and does not mean it."

In reply to a further question, Mr. Burgin, the Minister of Transport, said that conversations with the interested parties were continuing.

Institution of Electrical Engineers

The Summer Meeting of the Institution of Electrical Engineers for July, 1938, will be held in Birmingham and district from July 4th to 8th, inclusive, at the invitation of the chairman and committee of the South Midland Centre. An interesting programme has been prepared by the local committee, and in addition to receptions and dances it provides features of technical interest in the form of visits to the Birmingham Corporation's power station and the Central Electricity Board's sub-station at Hams Hall; the General Electric Co.'s Works, Witton; the Austin Motor Co.'s Works, Longbridge; the British Thomson-Houston Co.'s Works, Rugby; the Stourport generating station of the Shropshire, Worcestershire & Staffordshire Electric Power Co.; the New Telephone House, Birmingham; and interesting features in the area of the Midland Counties Electric Supply Co., Ltd. There will also be one or two interesting country drives.

Proposing "The Institution" at the annual dinner on January 26th of the North-Eastern Centre of the I.E.E. at Newcastle-on-Tyne, Lord Eustace Percy, Rector of King's College, Newcastle, referred to the insufficient accommodation at King's College for electrical engineering and said that a university like Durham demanded that it should command the range of laboratories necessary for it to carry out the work industry expected from a university. Sir George Lee, President I.E.E., contended that large-scale experiments should not be carried out in universities but rather in large works.

Col. S. E. Monkhouse proposed "The Guests," and Col. Sir F. Simpson replied. Others who spoke included the Lord Mayor of Newcastle (Ald. G. Oliver), and Mr. R. W. Gregory, past chairman of the North-Eastern Centre. Mr. W. H. Horsley (Chairman of the Centre), presided.

A smoking concert will be held by the North-Western Students' Section of the I.E.E. on February 22nd at the Engineers' Club, Manchester. Tickets (2s. each) can be obtained from the hon. assistant secretary, Mr. A. D. Johnson, "Tintagel," Fairfax Drive, Wilmslow, Cheshire.

The Batti-Wallahs

At the monthly luncheon of the Batti-Wallahs' Society on January 27th, Col. Sir T. F. Purves, president, occupied the chair and the principal guest was Lord Sempill, who spoke on certain aspects of commercial aviation. He dealt chiefly with methods of combating the formation of ice on machines while in flight and means of assisting take-off so as to enable aeroplanes to carry greater pay-loads. Lieut-Col. W. A. Vignoles, past-president, proposed the vote of thanks.

Mining Electrical Engineers

The headquarters for the summer meeting in Glasgow of the Association of Mining Electrical Engineers is the Grand Hotel, Charing Cross, Glasgow.

Single-phase Capacitor Motors

Mr. P. Huggins, the author of the article on the above subject in our issue of January 28th writes to point out a printer's error. The expression on page 122, right-hand column, sixth line from the bottom, should read:—

$$(\mu F = I_K \times 10^6 / 2\pi \times \text{frequency} \times V_K)$$

E.A.W. Activities

"The Kind of House I Want," "Mine Lighting Through the Ages," "Generation of Electricity," and "The Design of Domestic Electrical Equipment," are some of the interesting titles of lectures and debates to be held by the London Branch of the Electrical Association for Women and the Teachers' and Demonstrators' Circles.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

AINSCOW anti-vibrator for industrial fittings.

CENTURY washing machine.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

In our issue of January 7th we referred to a proposal on behalf of the mining and electrical industries in the North of England to make a presentation to **Professor W. M. Thornton.** This presentation was recently made by Col. Sir Frank Simpson.

Mr. H. L. Partington, of the Lancashire Electric Power Co., has been appointed assistant mains superintendent in the Walsall Corporation Electric Supply Department. **Mr. E. A. Thomas,** also of the L.E.P. Co., has been appointed service engineer.

The Senate of the National University of Ireland has decided to confer the Honorary Degree of Doctor of Science on **Sir John Purser Griffith,** M.A.I., M.Inst.C.E., and **Mr. L. J. Kettle,** M.I.C.E.I., M.I.Mech.E., M.I.E.E. Sir John Griffith has been associated with many large development schemes in Ireland, including the development of the River Liffey at Poulaphouca as a source of hydro-electric power. For this he obtained the necessary powers from the Oireachtas and presented his plans to the State, and the scheme is now being carried out by the Electricity Supply Board. Mr. Kettle, after leaving the Royal University of Ireland, entered Faraday House, where he obtained the Maxwell Scholarship with first class honours diploma and first place. He gained extensive practical training in the works of R. Stephenson & Co., Newcastle-on-Tyne; Maschinenfabrik Oerlikon, Switzerland; Société des Forces Electriques de la Gûole at St. Imier, France; and the General Electric Co. He returned to Ireland in 1912 as deputy city electrical engineer of Dublin, and became city electrical engineer and manager in 1918, which position he held until the Dublin Corporation Electricity Department was taken over by the Electricity Supply Board in 1929. His services were retained by the Electricity Supply Board in an advisory capacity until in 1934 he was appointed a member of the Board. He acted on the Water Power Resources of Ireland Sub-Committee, 1918-20, and the formation of this Committee, which aroused public interest in water power and later prepared the way for the hydro-electric development of the Shannon and Liffey, was due to his representations.

Mr. L. J. Kettle

Lord Hirst was elected president of the Radio Manufacturers' Association at the annual general meeting held last week. **Major L. H. Peter** (Westinghouse Brake and Signal Co.) was elected chairman and **Mr. J. N. Thomas** (A. C. Cossor, Ltd.) vice-chairman. It was announced at the same meeting that **Mr. D. Grant Strachan** had expressed a wish to retire from the position of director of the Association during the current year.

L.N.A., Ltd.

Major L. H. Peter

Mr. A. Middleton (Ferranti, Ltd.) has been elected chairman of the Radio Component Manufacturers' Association. **Mr. R. Weese** (Quadrant Carbon and Metal Products, Ltd.) has been elected vice-chairman. The new president is **Sir Percy Greenaway, Bt.**

Mr. A. Forbes, who has been lighting inspector to Aberdeen Corporation during the past five years and prior to that served in the Burgh Surveyor's Department, is retiring at the end of April under the age limit. The Watching Committee of the Town Council recommends that the Lighting Department shall be continued as a separate department and that steps shall be taken to fill the vacancy. Mr. Forbes has seen many changes in the lighting of the streets during his term of office and has been largely instrumental in introducing some of the recent improvements in the lighting system.

Mr. A. F. May, of the Aldershot Corporation Electricity Department, has been appointed electrical technician to the Hong Kong Government.

Mr. W. H. Sharpe has been appointed mains engineer with the Stafford Corporation Electricity Department, at a salary of £443.

Mr. A. F. May

Members of the Huddersfield Corporation Electricity Department recently gathered at a supper at which the retirements of **Mr. J. W. Turner,** borough electrical engineer, and **Mr. R. Milburn,** boiler house superintendent, were marked by presentations from members of the Department. Mr. Edgar Lunn, the new engineer, presided, and made the presentation of an electric clock and a case of pipes to Mr. Milburn. Mr. Turner was not able to be present owing to ill-health, and on his behalf Mr. Lunn received an illuminated address, with a set of verandah furniture, and there was also on view a silver salver presented to Mr. Turner by Alderman T. Shires, chairman of the Electricity Committee.

We are pleased to learn that **Mr. C. C. Ferguson,** secretary of the Institution of Heating and Ventilating Engineers, is making a good recovery from the injuries received in the recent railway disaster at Bedford, although we are informed he will not resume his secretarial duties for some time to come.

Nelson Town Council has now agreed to **Mr. T. D. Martin,** engineer of the Nelson electricity undertaking, taking a general oversight over the Colne electricity undertaking. The arrangement is understood to be only a temporary one, and Mr. Martin is not to receive any salary for his advice to Colne.

Mr. N. R. Greathead has relinquished his position as sales engineer with Johnson & Phillips, Ltd., and has joined the staff of Flinders (Wholesale), Ltd., Ipswich. He joined Johnson & Phillips in 1931 at their Bristol office, and from 1933 to 1935 was in charge of the company's Ipswich branch, being subsequently transferred to Charlton, where he took over the outside sales of the radio relay section.

Mr. N. R. Greathead

The marriage has been arranged to take place on February 11th of **Mr. W. H. Rylance,** of the Manchester branch of the General Electric Co., Ltd., and **Miss Kathleen May Wilson,** the second daughter of Mr. L. E. Wilson, M.I.E.E., and Mrs. L. E. Wilson, of Manchester. Although Mr. Wilson is recovering from his recent injuries he will not be able to be present, and his place will be taken by his elder son, Mr. L. J. Wilson, A.I.E.E., fields manager, British Controlled Oilfields, Ltd., Venezuela, who is now on leave.

At Savoy Court on January 28th, **Sir John Snell,** G.B.E., was presented with an inscribed silver fruit tazza from the Electricity Commissioners and staff, on his retirement from the position of chairman of the Commission. The presentation was made by Sir Cyril Hurcomb, the new chairman, who was supported by his colleagues, Mr. J. M. Kennedy and Mr. C. G. Morley New; by three former Commissioners, Sir Harry Haward, Sir Archibald Page, and Sir Leonard Pearce; by the secretary, Mr. R. T. G. French; the chief engineering inspector, Mr. H. Nimmo; and a large number of the staff both present and former. Three former Commissioners, Mr. H. Booth, Mr. W. W. Lackie, and Mr. T. P. Wilmshurst, were unable to be present, but sent their good wishes. The former members of the staff of the Electricity Commission who attended included Mr. J. C. Dalton, Mr. E. W. Dickinson, Colonel T. C. Ekin, and Mr. J. A. Lee. Speeches in appreciation of Sir John and of his work in the Electricity Commission and for the electricity supply industry were made by Sir Harry Haward on behalf of former Commissioners and

by Mr. French on behalf of present and former members of the staff. In making the presentation, Sir Cyril Hurcomb referred to the confidence in which Sir John had been held by successive Ministers of Transport. In expressing his thanks for the presentation and his appreciation of the good wishes extended to himself and Lady Snell, Sir John referred to the happy relations that had always existed between himself, his colleagues, and the staff, and wished the Electricity Commission every success in the future.

Liverpool Appointments.—In consequence of the retirement of Mr. L. Breach, chief electrical assistant, and Mr. F. Carman, senior mains assistant, and the appointment of Mr. R. B. C. Stirrup to the position of chief electrical assistant, the Liverpool Electric Power and Lighting Committee proposes to make a number of appointments, including the following: Mr. J. E. Dale, A.M.I.E.E., engineering assistant (electrical), to be second electrical assistant; Mr. H. Fawcett, draughtsman, to be engineering assistant (electrical); Mr. F. W. T. Turner, mains assistant, to be senior mains assistant.

Obituary

Mr. J. G. Anderson.—The death occurred on January 20th, at the age of thirty-nine, of Mr. John Gordon Anderson, convener of the Lighting Committee of the Grantown-on-Spey Town Council. His father, the late ex-Provost Anderson, was a pioneer of municipal electricity undertakings in the North, and Mr. J. G. Anderson managed the Grantown plant until three years ago, when it was acquired by the Grampian Electricity Supply Co.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Brabants, Ltd.—Private company. Registered in Dublin January 25th. Capital, £1,000. Objects: To acquire the business of a radio dealer, carried on by J. R. E. Brabants, Cork. The directors are: J. R. E. Brabants and Mrs. E. Brabants, The Beeches, Model Farm Road, Cork. Secretary: P. Uniacke, 4, Lapps Quay, Cork.

E. R. Harveyson & Co., Ltd.—Private company. Registered January 27th. Capital, £7,000. Objects: To carry on the business of wholesalers of radio sets and equipment, accessories or parts, &c. The directors are: E. R. Harveyson (permanent managing director), 19, Willow Way, Finchley, N.3, and three others. Registered office: Albert Place, Nether Street, Finchley, N.3.

J. D. Jones & Co. (London), Ltd.—Private company. Registered January 26th. Capital, £1,000. Objects: To carry on the business of importers, exporters and shippers, manufacturers and merchants of mica, micanite and insulating and electrical equipment, &c. The permanent directors are: F. Turnbull, 8, Galesway, Woodford Bridge, Essex, and W. A. Godfrey, Folkland, Higher Drive, Purley. Registered office: Loftus Works, 42, Heigham Road, East Ham, E.6.

Johnson & Allen, Ltd.—Private company. Registered January 27th. Capital, £2,000. Objects: To carry on the business of manufacturers of electrodes for welding, metallurgists, chemists, physicists, electricians, engineers, &c. The directors are: H. R. S. Johnson, 22, The Grove, Totley, Sheffield; and A. Allen, 27, Cardoness Road, Sheffield, 10. Registered office: 23, Granville Street, Sheffield, 2.

Walter Denis Contacts Co., Ltd.—Private company. Registered January 29th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in automatic machines and machine parts, electrical contacts, electric and mechanical apparatus, engineers, &c. The subscribers are: G. T. Lyne, 82, Blake Avenue, Barking; and W. S. Corlett, 201a, Birkbeck Road, Beckenham. Secretary (*pro tem*): G. T. Lyne. Registered office: 383a, Lewisham High Street, S.E.13.

Antiference, Ltd.—Private company. Registered January 28th. Capital, £100. Objects: To carry on the business of engineers, manufacturers of and dealers in equipment for the suppression of radio interference, &c. The directors are: N. M. Best, 58, Menelik Road, West Hampstead; and N. S. Beebe, 127, Station Road, Hendon. Registered office: 176, Wardour Street, W.1.

Carlux Electrical Services, Ltd.—Private company. Registered January 28th. Capital, £2,500. Objects: To acquire the goodwill of the business of "Carlux Electrical Services" carried on at 17, Nicholas Street, Chester. The directors are: C. Cullimore, Christleton, Chester; E. R. B. Farrer, Cecil House, Somerset Road, Wimbledon, S.W.19; and N. Ranson, Mill Cottage, Llanferres. Registered office: 17, Nicholas Street, Chester.

Beck & Pollitzer-Strand Electric, Ltd.—Private company. Registered January 29th. Nominal capital, £100. Objects: To carry on the business of electrical engineers, sign and effect makers and suppliers, hirers and general contractors and manufacturers and repairers of and dealers in dynamos, motors, armatures, and electric plant and supplies, &c. The permanent directors are: G. E. P. Pollitzer, Bell Moor, The Heath, Hampstead, N.W.3 (director of Beck & Pollitzer-Contracts, Ltd.); and J. D. H. Sheridan, "Monalea," 6, Uplands, Beckenham, Kent (managing director of Strand Electric and Engineering Co., Ltd.). Secretary: C. A. Collis. Registered office: Universal House, Southwark Bridge, S.E.1.

Returns of Electrical Companies

Central London Electricity, Ltd. (formerly Charing Cross Electricity Supply Co., Ltd.).—Particulars have been filed of debenture stock to secure £500,000 (ranking *pari passu* with debenture stock constituted by trust deed dated June 13th, 1935), authorised January 5th, 1938, and covered by trust deed dated January 5th, 1938, constituting a first floating charge on the property comprised in the original deed. The whole amount is now issued. The trustees are Baring Brothers & Co., Ltd., 8, Bishopsgate, E.C.

Collings and Ayres, Ltd.—Deposit on January 18th, 1938, of deeds of 23, Tavistock Street, Bedford, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

A. Robinson & Co., Ltd.—Satisfaction in full on November 1st, 1937, of debenture dated February 21st, 1922, and registered March 4th, 1922, securing £10,000.

Lightning Service Radio Suppliers, Ltd.—James A. McNab, of 51, Havelock Road, Hastings, was appointed receiver on January 20th, 1938, under powers contained in debenture dated March 16th, 1937.

Vaughan Martin, Ltd.—Particulars filed of £3,000 debentures, authorised January 5th, 1938, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,000.

E. S. Archdale (Leeds), Ltd.—Mortgage and debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated December 31st, 1937, to secure all moneys due or to become due from the company to the District Bank, Ltd.

Trevor Fry, Ltd.—Particulars filed of £500 debentures, authorised January 18th, 1938, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £300.

Bourton-on-the-Water Electric Light & Power Co., Ltd.—Satisfaction in full on December 31st, 1934, of 6 per cent. 1st debentures authorised August 12th, 1912, and registered November 6th, 1912, and 6 per cent. 2nd debentures authorised August 27th, 1915, and registered June 7th, 1916, securing £750 and £600 respectively.

Mottershead & Deason, Ltd.—Satisfaction on January 6th, 1938, of mortgage registered March 20th, 1937. (According to the register of mortgages, the only deed registered March 20th, 1937, was a charge which originally secured all moneys due to bank.)

Remax, Ltd.—Satisfaction on April 18th, 1934, of mortgage or charge dated August 8th, 1932, and registered August 16th, 1932. (According to the register of mortgages, the mortgage registered August 16th, 1932, originally secured all moneys due to bank.)

Oliver Pell Control, Ltd.—Satisfaction in full on December 20th, 1937, of Land Registration Charge dated August 25th, 1931, and registered September 9th, 1931. (According to the register of mortgages, the charge registered September 9th, 1931, originally secured all moneys due to bank.)

Grierson, Ltd.—Capital, £10,000 in 4,000 preference and 6,000 ordinary shares of £1. Return dated December 29th, 1937. 4,001 ordinary shares taken up. £4,001 paid. Mortgages and charges, nil.

Highgate Cable & Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 9th, 1937. 600 shares taken up. £600 paid. Mortgages and charges, nil.

Lamp Manufacturing & Railway Supplies, Ltd.—Capital, £9,000 in 5,500 preference and 3,500 ordinary shares of £1. Return dated December 15th, 1937. 4,500 preference and 3,003 ordinary shares taken up. £4,503 paid. £3,000 considered as paid. Mortgages and charges, nil.

B. French, Ltd.—Capital, £5,000 in £1 shares. Return dated November 1st, 1937. 4,750 shares taken up. £4,750 paid. Mortgages and charges, nil.

British Radiophone, Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1. Return dated November 3rd, 1937. Two shares taken up. £2 paid. Mortgages and charges nil.

Erimus Electrical Factors, Ltd.—Capital, £500 in £1 shares. Return dated September 28th, 1937. 375 shares taken up. £335 paid, £40 calls unpaid. Mortgages and charges nil.

Electrical Housewares, Ltd.—Capital, £100 in £1 shares. Return dated December 6th, 1937. All shares taken up. £100 paid. Mortgages and charges nil.

Berkeley & Young, Ltd.—Capital, £22,000 in £1 shares. Return dated 9th (filed November 3rd), 1937. 17,796 shares taken up. £7,786 paid, £10,010 considered as paid. Mortgages and charges nil.

Claude B. Barton, Ltd.—Capital, £1,000 in £1 shares. Return dated October 7th, 1937. 900 shares taken up. £900 paid. Mortgages and charges nil.

Kelvin Batteries, Ltd.—Capital, £1,000 in £1 shares. Return dated September 3rd (filed October 28th), 1937. 975 shares taken up. £975 paid. Mortgages and charges, nil.

Jacob White & Co., Ltd.—The nominal capital has been increased by the addition of £5,000, in £1 shares, beyond the registered capital of £10,000.

Minehead Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £20,000 beyond the registered capital of £110,000. The additional capital is divided into 13,000 preference and 7,000 ordinary shares of £1 each. This increase is for the purpose of acquiring the whole of the property and undertaking of the Porlock & District Electric Supply Co., Ltd.

City Notes

The Oxford Electric Co., Ltd.—At a meeting of shareholders held on January 28th offers for the undertaking from the Wessex Electricity Co. and the Oxford City Corporation were considered, and on a show of hands nineteen voted in favour and twenty-seven against the directors' recommendation, which was for sale to the Wessex company. Lord Meston (chairman), who presided, announced that a poll would be held. This resulted as follows:—In favour of the directors' recommendation, 260,425; against, 23,300. The *Financial Times* reports that there was much discussion as to the position of the preference shareholders in the event of liquidation. Lord Meston stated that an examination of the Corporation's offer had shown that it was not substantially higher than the Wessex Company's offer. On the contrary, the Wessex offer was slightly more advantageous to the ordinary shareholders and was roughly £2,000 better. The ordinary shareholders would not suffer by the rejection of the Corporation's offer, because, as had been intimated, Edmundsons had guaranteed to pay the ordinary shareholders 6d. more per share than would be received under the Corporation's offer. Lord Meston was asked on behalf of the Public Trustee to explain the position of the preference shareholders. If the resolution was passed, would they be repaid at par, or would they be made some offer which would be more equitable? In the event of liquidation it would mean great hardship to such shareholders if only par value was paid, particularly where trust funds were concerned. Lord Meston replied that it was impossible and premature at the present stage to deal with the question raised. Brig.-Gen. Sir Osborne Mance suggested that if Edmundsons would prefer to accept an independent assessment of a fair price for the preference shares, they had only to wait until conditions for other electricity undertakings were settled in the forthcoming Parliamentary Bill instead of rushing the matter through before the terms of compensation in the Bill were made public. He asked the chairman to suggest to the controlling company that it should desist from carrying out the proposal which was not in accordance with present-day responsibilities of large corporations. It was pointed out in reply that the articles of association of the company provided that whereas the preference shareholders had a prior claim to both capital and interest they were not entitled to any further participation. Brig.-Gen. Mance stated that this was devised to meet the contingency of the company going into liquidation through adversity and not being sold when it was a prosperous concern. Lord Meston said he had suggested measures for securing that the preference shareholders should get more than 20s. in the £, but they had to remember the articles of association.

The Rheostatic Co., Ltd.—Presiding at the annual meeting on January 31st, Mr. L. Satchwell (chairman), said that the intended extensions to premises had been completed and further extensions, necessitated by the increased demand for their thermostats and resistances, had been commenced. In parallel with these building extensions considerable additions to plant had been made. The continued activity of business in their specialised lines of manufacture had more than justified these additions to assets. During the last six months the buildings and plant had been used to their full capacity without completely satisfying the demand, and the demand to-day was being maintained at that higher level. Exports had increased considerably both to the Dominions and to foreign countries, where they were in competition principally with American manufacturers. The progress of their French subsidiary had been encouraging. Despite rumours in certain quarters of a possible slump in general business conditions, they had no facts before them which would justify any immediate anticipation of a reduction in turnover. They were, therefore, proceeding with confidence in their schemes for development of the business, especially having regard to the production of new and additional designs of apparatus needed by the heating industry.

Richardsons, Westgarth & Co.—Terms have been announced of the capital reconstruction scheme. The company proposes to amalgamate with the North-Eastern Marine Engineering Co. & George Clarke (1936). Richardsons will be the merger company, but the North-Eastern Co. shareholders will bring the largest amount of assets and profits into the combined undertaking. Shareholders in Richardsons will receive in the reconstruction: For each £1 preference share, two new ordinary 5s. shares, all dividend arrears from May 1st, 1930, being cancelled; for every five ordinary £1 shares, one new 5s. ordinary share. The capital is first to be reduced to £507,500, and will then be increased, for the purposes of the scheme, to £612,312 issued and £1,120,000 authorised, in ordinary 5s. shares. On the scheme becoming effective it is proposed to issue £500,000 5½ per cent. first mortgage debenture stock at par in order to pay off all secured liabilities of the three companies and add to the working capital.

The Singapore Traction Co., Ltd., reports a profit for the year ended September 30th of £65,926, as compared with £62,134 in the preceding year, to which is added £1,573 brought in, making £67,499. After providing for depreciation and renewals, &c., there is a balance of £9,365, out of which it is proposed to pay a final ordinary dividend of 5 per cent., making 7½ per cent. for the year (against 5 per cent.). The balance carried forward is £3,170. The Inland Revenue authorities have agreed that the sum of £100,000, paid by way of compensation to the Shanghai Electric Construction Co. is allowable as a deduction from profits for income tax purposes. The resultant saving in income tax, the full amount of which has not yet accrued, is shown in the accounts under the heading of "taxation suspense account." The company is not liable to N.D.C.

J. & E. Hall, Ltd., report a net profit for the year ended September 30th of £44,888, as compared with £65,195 in the preceding year, to which is added £29,293 brought in. The ordinary dividend for the year is 7 per cent. (against 8½ per cent.), staff pension reserve receives £5,000, and £30,621 is carried forward.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved.—Electrical Leakage Detectors, Ltd.; Electrical Relay Co., Ltd.; Guybar Electrical System, Ltd.; H. & J. Radio, Ltd.; Herald Electric Stores, Ltd.; Hiraradio, Ltd.; Kent Electrical Co., Ltd.; Kolhapur Hydro-Electric and Aluminium Co., Ltd.; M. and B. Radio, Ltd.; Wiring Installations (Housing), Ltd.

German Electrical Companies.—A *Reuter* message from Berlin states that the annual report for 1937 of the Siemens & Halske Electrical Works shows a net profit of 15,107,494 Rm. against 14,665,348 Rm. in 1936. A dividend of 10 per cent. has been declared for 1937 (against 9 per cent.).

The Siemens-Schuckert Electrical Works report a net profit of 13,791,226 Rm. and a dividend of 7 per cent. for 1937, as compared with a net profit of 13,203,534 Rm. and a dividend of 6 per cent. in 1936.

Bristol Corporation.—The list of applications was to open yesterday (Thursday) for an issue of £2,000,000 Bristol Corporation 3½ per cent. redeemable stock, 1961-1966. The price of issue is £101 10s. per cent. The proceeds will be used to repay loans incurred for capital expenditure, including £1,125,000 for the tramways and omnibus undertaking and £660,600 for the electricity undertaking.

The London Power Co., Ltd.—The list was to open and close yesterday (Thursday) for an issue of £1,500,000 3½ per cent. redeemable debenture stock (1952-72) at £99 per cent. The stock will rank *pari passu* as regards principal and interest with the existing debentures. The proceeds are required to provide for extensions of the company's business, to meet obligations undertaken for extensions of its generating stations, mains and coal-carrying ships, for repayment of bank loans, and for general purposes.

The London Electric Supply Corporation, Ltd., has declared a final dividend of 4 per cent. (less tax at 5s.) on the ordinary shares, making 7 per cent. for the year. It is also proposed to pay a special bonus of 3 per cent. (less tax) on the ordinary shares, in celebration of the jubilee year of the company.

The Bournemouth & Poole Electric Supply Co., Ltd., has declared the final dividends on the 4½ per cent. and 6 per cent. preference shares.

The Mersey Railway Co. has announced a dividend of ⅞ per cent. on the ordinary stock for 1937 (unchanged).

The Power Securities Corporation, Ltd., is paying a dividend of 7 per cent., less tax, for 1937 (same).

Stocks and Shares

TUESDAY EVENING.

EVERY now and then, the Stock Exchange markets show a disposition to throw off the unfortunate influence which American politics exercise upon the prices of British stocks and shares. Each effort to escape from this influence seems, however, to be doomed to disappointment, inasmuch as the fact remains that America, being the principal consuming and producing country, must dictate, to some extent, the prices of raw materials.

The conflict between President Roosevelt and Big Business finds reflection not only in weakness throughout the American markets, but in the necessity for providing cash against losses made by people on this side who have been dabbling in American shares. Fortunately, the money market is able to shake itself free from this particular influence, and safety-first stocks are holding their prices with noticeable firmness.

New issues from front-rank borrowers are once more appearing. The London Power Company makes an offer this week of one-and-a-half million pounds 3½ per cent. redeemable debenture stock at 99. It will be recalled that the company was formed 18 years ago in order to take over the power stations and main transmission of nine of the London electricity supply companies. The company's 5 per cent. debenture stock, quoted in our weekly list, stands at 108, and the 3½ per cent. redeemable debenture is quoted at 93.

Gilt-edged Stocks

With investment still in the mood for security, the gilt-edged market remains the main outlet for the pressure of money seeking employment. Persistent buying on account of the public and of the big institutions has again made prices higher on the week. Interest appears to be spreading more widely to the longer-dated stocks, which have hitherto taken second place to issues having a near and definite date for redemption. The latter have been favoured as ensuring safety of capital against the chance of an eventual downward turn in gilt-edged prices. Substantial support for stocks having a more distant date, or even no date for redemption seems to indicate confidence in the strength of gilt-edged prices for some time to come. Central Electricity Board stocks, which are mostly of the longer-dated variety, have been moving upwards steadily of late, but show little change on the past week. Among London Transport Board stocks, the "B" and "C" stocks at 121½ and 80½ respectively, have each advanced 10s. London Electric Transport guaranteed stock at 91 is a point to the good.

Electricity Supply Shares

With the approach of the Electricity Bill, the market in the shares concerned gains in cheerfulness. County of Londons, for instance, are up to 51s., or 2s. better than a fortnight ago. Northamptons, now 47s. 6d., have repeated the previous week's advance of ⅛. Lancashires, North Metropolitans and Scottish Power are all higher. British Power and Light, at 28s., are reactionary after the sharp advance, but Edmundsons have gone ahead to 38s., with the new shares at a premium of 7s. 9d. over the issued price of 30s. This buoyancy rests, of course, on the belief that the reorganisation Bill will interfere but little with the present welfare of the companies or their shareholders. Assuming the removal of

uncertainties on this score, it is agreed that the market will be able to follow its customary inclination to take its pace from the gilt-edged market, in which case, the strength of gilt-edged prices should add to the attraction of a 4 to 4½ per cent. yield on such stable investments as electricity supply shares.

Preference Shares

Preference shareholders of all kinds will watch closely for the outcome of a plan by which one Edmundsons' Electricity Corporation subsidiary, the Wessex Company, is to buy another, the Oxford Electric undertaking. Throughout the negotiations, holders of the latter's 6 per cent. preference shares have been left uninformed as to their position in the event of a voluntary liquidation. Lately, the shares have been standing at about 26s. The present price is called 20s. to 25s. On a liquidation, the shares are legally entitled to no more than repayment at par, plus accrued interest. Unless, therefore, some special compensation is given—and the directors have declined to commit themselves on this point—proprietors face the possibility of an unpleasant capital loss on redemption. Whatever the rights or wrongs of the matter, the uncertainty which has arisen serves to strengthen the case of those austere investors who are chary of preference shares standing at a high premium over the nominal values. With amalgamation so much in the air at the present time, the case of Oxford Electric preference shareholders is very pertinent. From the practical point of view, the electricity supply companies whose shares are quoted in the first section of our price list, are of such magnitude as to make it tolerably certain that they would do the absorbing in any case of amalgamation. Consequently, the status of their own preference shares is not likely to be called in question, and the quotations are, accordingly, hardly changed on the week.

Cable and Wireless

Holders of Cable and Wireless ordinary stock are beginning to ask what dividend they may expect to receive a couple of months hence, when the announcement is due. From the present price of the stock—64—it is apparent that optimism is tempered with caution. Stock Exchange anticipations are in accordance with the officially forecast dividend of 4 per cent., with figures that imply repetition of this rate twelve months hence. If this estimate is fulfilled, the stock, at 64, would pay 6¼ per cent. on the money, and upon any revival of international business there would be a hope, of course, of the traffics improving sufficiently to permit of a higher distribution in 1939.

This may be looking a long way ahead, but holders of the stock may reasonably claim to expect some kind of reward, even if only in the shape of hope, in return for the patience which they have exercised.

Trams and Tractions

Holders of Tillings ordinary shares are receiving another "melon" in the shape of a one-in-four scrip bonus; this is in addition to a cash dividend making 10 per cent. for the year. For last year the dividend was the same, but without a bonus; in the two previous years scrip bonuses of 25 per cent. and 100 per cent. respectively accompanied dividends of 10 per cent. and 15 per cent. After dropping, on the announcement, from 56s. 9d. to 55 9s., the price of the shares rebounded to 57s. 9d.—still cum dividend and bonus—on publication of the full results. For this recovery the healthy appearance of the balance sheet was mainly responsible. Tilling and British Automobile Traction shares have fallen 1s. 6d. to 56s., despite the higher profits shown in the report. The deferred shares of British Electric Traction, which company shares with Tillings the control of the Tillings and B.A. Traction concern, have drooped to 1,012. The home railway market has been cheered by better traffics figures, but remains quiet on the approach of the time for the dividend announcements. Brazilian Tractions, at 11¼, are still not far from their lowest point of the year. Activity in Anglo-Argentine Tramway issues is less noticeable; the 5 per cent. debentures are another 2 points down, at 20.

Miscellaneous Matters

Electrical equipment shares are holding their ground well under the idle conditions of industrial markets generally. Prices in one or two places may be inclined to sag, but movements are, as a rule, unimportant. General Electrics, at 76s., and Associated Electricals, at 43s., are each lower on the week. Ericssons, at 2 1/16, show 1/16 fall, and Brush, at 20½, remain out of favour. Telegraph Constructions, on the other hand, are up from 2⅜ to 2 7/16. With the dividend out of the way, Westinghouse Brakes have gone back to 55s. 3d. Consolidated Signals, at 5½, are ¼ easier. Dealings have started in the new Ismay Industries shares, the ordinary being quoted at 5s. 6d. and the preference at 19s. 6d. America's influence on markets this side of the Atlantic continues to be unfavourable. While it is thought that the extra rearmament expenditure may do something to enliven United States industries, optimism has been chilled by an apparent hardening of the President's hostile attitude towards the business community. American Telegraph and Telephones are 5 down on fears of a cut in the dividend. The iron, steel and armament group shows a good deal of heaviness. Rubber shares also are weaker, but the speech of Sir John Simon this (Tuesday) night hints at possible developments that might quicken international trade and, thereby, assist the markets in commodities.

Share List of Electrical Companies

	Dividend. Nom. Previous.	Dividend. Last.	Price Feb. 1.	Rise or Fall.	Yield £ s. d.
HOME ELECTRICITY COMPANIES.					
Bournemouth and Poole	1	15	67/6	—	4 9 0
City of London	1	7½	34/–	—	4 8 3
Clyde Valley	1	7	2	—	4 0 0
County of London	1	10½	51/–	+6d.	4 2 4
Edmundson's 7% Pref.	1	7	33/–	—	4 4 10
Do. Ord.	1	8	38/–	+1/–	4 14 9
Elec. Dis. Yorkshire	1	9	42/–	—	4 5 10
Elec. Fin. and Securities	1	12½	52/6	—	4 15 3
Elec. Supply Corporation	1	11	52/6	+	4 11 5
Lancs Light and Power	1	7½	35/–	+6d.	4 5 9
Lond. Assoc. Electric	1	—	32/–	+9d.	4 7 6
London Electric	1	7	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	108	+½	4 12 7
Metropolitan	1	10	46/–	—	4 7 0
Midland Counties	1	7½	37/6	—	4 5 0
Mid. Elec. Power	1	8	9	2 1/16 —	4 7 4
North Eastern Electric Ordinary	1	6	7	32/– —	4 7 6
Do. 7% Pref.	1	7	7	34/– —	4 2 4
Northampton	1	10	10	47/6	+1/16	4 4 3
Notting Hill 6% Pref.	10	6	6	14 —	4 5 9
North Met. Elec. Ordinary	1	10	10	48/3	+9d.	4 3 0
Do. do. 6% Pref.	1	6	6	30/– —	4 0 0
Scottish Power	1	8	8	37/6	+6d.	4 5 4
South London	1	7	7	32/6 —	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/6 —	6 19 6
Yorkshire Elec.	1	8	8	40/6 —	3 19 0
PUBLIC BOARDS					
Central Electricity, 1950–70	Stock	5	5	114 —	4 7 9
Do. 1955–75	,,	5	5	116½ —	4 5 10
Do. 1951–73	,,	4½	4½	110 —	4 1 10
Do. 1963–93	,,	—	3½	99 —	3 10 8
London Elec. Trans Gtd.	,,	—	2½	91	+1	2 15 0
London & Home Counties, 1955–75	,,	4½	4½	110 —	4 1 10
London Passenger Transport, A	,,	—	4½	118½ —	3 16 3
Do. do. B	,,	—	5	121½	+½	4 2 4
Do. do. C	,,	4	4½	80½	+½	5 5 7
West Midlands Joint Elec. 1948–68	,,	—	5	112 —	4 9 3
TELEGRAPH AND TELEPHONE.					
American Tel. & Tel.	$160	9	9	142½	−5	6 6 4
Anglo-Am. Tel. Pref.	Stock	6	6	114½ —	5 4 10
Do. Def.	,,	1½	1½	28 —	5 7 3
Cable & Wireless 5½% Pref.	,,	4½	5½	102½	−½	5 6 10
Do. Ord.	,,	—	—	64 —	—
Do. Income	,,	—	—	101½ —	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	14¾ —	3 12 9
Do. do. Pref.	10	6	6	13½ —	4 6 6
Great Northern Tel.	10	20	20	30½	−½	5 1 3
Marconi-Marine	1	10	7½	29/6 —	5 1 8
Oriental Telephone Ord.	1	12*	12*	2¾ —	4 3 6
HOME AND FOREIGN TRAMS, ETC.					
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/6 —	—
Do. do. 2nd Pref.	5	Nil	Nil	4/6 —	—
Do. do. 5% Deb.	Stock	Nil	Nil	20	−2	—
British Electric Traction Def. Ord.	,,	5	5	1012	−25	—
Do. do. Pref. Ord.	,,	8	8	165 —	4 17 0
Brazil Traction	$100	70 cts.	$1	11¼ —	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	103½ —	4 14 9
Mexican Light Common	$100	Nil	Nil	2 —	—
Do. 1st Bonds	$500	5	5	35 —	—
Victoria Falls Ord.	1	20	12	3 —	4 0 0
West Riding	1	6½	10	2 —	5 0 0
MANUFACTURING COMPANIES.					
Aron Electricity Ord.	1	15	15	2 —	7 10 0
Assoc. Elec. Ord.	1	8	10	43/–	−1/–	4 13 0
Do. Pref.	1	8	8	38/– —	4 4 6
Babcock & Wilcox	1	8	10	43/3	−6d.	4 12 6
British Aluminium Ord.	1	7½	10	47/6	+6d.	4 4 3
British Insulated Ord.	Stock	20	20	4¾ —	4 4 6
Brush Ord.	Stock	Nil	Nil	20½	−2	—
Callender's	1	15	15	4 7/16 —	3 9 1
Do. 6½% Pref.	1	6½	6½	31/3 —	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	27/6 —	—
Do. 8% Pref.	1	8	8	37/6 —	4 5 4
Electric Construction	1	7	10	1¾ —	5 14 4
Enfield Cable Ord.	1	25	25	5½ —	4 17 8
English Electric	1	Nil	Nil	30/	−6d.	—
Do. do. Pref.	1	6½	6½	25/6 —	5 2 0
Ericsson Tel.	5/–	20	25*	2 1/16	−1/16	3 0 7
Ever Ready	5/–	35	45	26/– —	8 13 2
Ferranti Pref.	1	7	7	27/6 —	5 1 10
G.E.C. Pref.	1	6½	6½	32/6 —	4 0 0
Do. Ord.	1	15	17½	76/–	−6d.	4 12 1
Henley's	5/–	30	15	19/6 —	3 17 0
Do. 4½% Pref.	1	4½	4½	1½ —	4 0 0
India-Rubber Pref.	1	5½	5½	22/–	+9d.	5 0 0
Johnson & Phillips	1	½	10	40/9 —	4 18 0
Lancashire Dynamo	1	10	20	3 1/16 —	5 12 4
Siemens Ord.	1	6	7½	28/9 —	5 4 4
Telegraph Construction	£1	Nil	7½	2 7/16	+1/16	3 1 6

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

20742. "Thermionic-valve amplifiers." P. W. Willans, A. J. Brown, and Baird Television, Ltd. July 7th, 1936. (477815)

1936

9895. "Battery grid pasting machines." Usl Battery Corporation. April 3rd, 1935. (477764.)

12061. "Scanning systems for television and the like." Scophony, Ltd., and F. Von Okolicsanyi. April 28th, 1936. (477604.)

15409. "Devices comprising cathode-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 20th, 1935. (477612.)

15460. "Television and like apparatus." Marconi's Wireless Telegraph Co., Ltd. May 31st, 1935. (477765.)

15536. "Electric motor and control systems." W. T. Gray, and Metropolitan-Vickers Electrical Co., Ltd. June 3rd, 1936. (477832.)

15793. "Production of oxide cathodes for electric-discharge tubes, and tubes provided with such cathodes." Egyesult Izzolampa es Villa-Mossagi Reszvenytarsasag. June 5th, 1935. (477767.)

18209. "Synchronous electric motors." Ferranti, Ltd., and E. Grundy. July 1st, 1936. (477835.)

18293. "Insulating casings for electrical apparatus." Allgemeine Elektricitats-Ges. July 1st, 1935. (477771.)

18445. "Lever-operated electric switches." C. H. Parsons, Ltd., and G. B. Handley. July 3rd, 1936. (477690.)

18452. "Radio-frequency receiving systems." F. R. W. Strafford, and Belling and Lee, Ltd. July 3rd, 1936. (477890.)

18564. "Contact structures for electric switches." British Thomson-Houston Co., Ltd., and H. E. Cox. July 3rd, 1936. (477691.)

18612. "Electric motors." British Thomson-Houston Co., Ltd., and J. R. Tole. July 4th, 1936. (477693.)

18613. "Mercury-arc rectifiers and other electric-discharge devices." British Thomson-Houston Co., Ltd., and F. P. Whitaker. July 4th, 1936. (477615.)

18650. "Electrically propelled vehicles, toys, and the like." H. E. Drinkwater. July 6th, 1936. (477953.)

18765. "Methods and apparatus for measuring ion-concentration." G. Kent, Ltd. January 11th, 1936. (477849.)

18769. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. July 5th, 1935. (477850.)

18773. "Torches, flashlights, or the like." Ever Ready Co. (Great Britain), Ltd. July 5th, 1935. (477851.)

18901. "Television and like receivers." Baird Television, Ltd., and A. H. Gilbert. July 8th, 1936. (477897.)

18912. "Control system for electrically driven separating machines." J. S. Pecker. July 8th, 1936. (477898.)

18914. "Electric cables." Pirelli-General Cable Works, Ltd., and H. T. Werren. July 8th, 1936. (477697.)

18939. "Metal-envelope electron tube." Egyesult Izzolampa es Villa-Mossagi Reszvenytarsasag. July 8th, 1935. (477900.)

18954. "Electric-discharge lamps." Universal Inventions, Ltd. July 9th, 1935. (477902.)

19026. "Radio receivers." Baird Television, Ltd., and L. R. Merdler. July 9th, 1936. (477906.)

19093. "Wireless systems, particularly direction finding apparatus." Panstwowe Zaklady Tele-Iradjottechniczne W. Warszawie. July 10th, 1935. (477963.)

19161. "Methods of and apparatus for producing high-frequency carrier currents." C. Lorenz Akt.-Ges. July 17th, 1935. (477912.)

19177. "Aerials and feeder systems for use in high-frequency signalling systems." E. C. Cork, and J. L. Pawsey. July 10th, 1936. (477914.)

19200. "Electric-discharge tubes containing secondary electron-emitting means." Radioakt.-Ges. D. S. Loewe. July 11th, 1935. (477916.)

19214. "Manufacture of electric cables for other insulated electric conductors." Solution Trust, Ltd. July 11th, 1935. (477917.)

19667. "Electrically driven erasing machines." B. F. Hall and B. J. Hall and Co., Ltd. July 15th, 1936. (477921.)

19888. "Acoustic rectifying devices and alternating-current signalling systems incorporating such devices." Standard Telephones and Cables, Ltd. August 1st, 1935. (477623.)

20341. "Liquid-break electric circuit-breakers." British Thomson-Houston Co., Ltd., J. M. Goodall, and H. E. Cox. July 22nd, 1936. (477702.)

20661. "Electro-magnetic devices." H. J. Osborn and H. J. Osborn & Sharp, Ltd. July 25th, 1936. (477856.)

22329. "Electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). August 13th, 1936. (Cognate applications 31065/36 and 1596/37.) (477708.)

23789. "Electric-discharge tube." Egyesult Izzolampa es Villa-Mossagi Reszvenytarsasag. August 31st, 1935. (477787.)

24533. "Supervisory devices for high potential transformers." Siemens-Schuckertwerke Akt.-Ges. September 10th, 1935. (Cognate application 24534/36.) (477788.)

25282. "Electric switch for use with prepayment meters." Landis & Gyr Akt.-Ges. September 21st, 1935. (477714.)

26106. "Electric condensers." C. Schusterius. September 25th, 1935. (477790.)

27111. "Indirectly heated thermionic cathodes." M-O Valve Co., Ltd., and M. Benjamin. October 6th, 1936. (477637.)

30682. "Secondary-emission electron multipliers." General Electric Co., Ltd., and W. H. Aldous. November 10th, 1936. (477648.)

32572. "Television and like systems." P. M. G. Toulon. November 27th, 1935. (477864.)

34141. "Electrical musical instruments." Baldwin Co. December 11th, 1936. (477653.)

35373. "Microphone apparatus operating with high-frequency current." O. K. Kolb (Palle Finn Beer.) December 24th, 1936. (477659.)

1937

2881. "Automatic control arrangements for thermionic valves." Standard Telephones & Cables, Ltd. February 1st, 1936. (477664.)

5228. "Electrical impedance networks." Siemens & Halske Akt.-Ges. February 22nd, 1936. (477738.)

5319. "Signalling apparatus for regulating traffic at cross-roads." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. February 22nd, 1936. (477739.)

6464. "Electron-discharge devices and arrangements for use on very short waves." Telefunken Ges. für Drahtlose Telegraphie. March 4th, 1936. (Cognate applications 6465/37 and 6466/37.) (477668.)

7334. "Electrode structures for electron tubes." C. Lorenz Akt.-Ges. March 16th, 1936. (Cognate application 7335/37.) (477669.)

10058. "Electron-discharge devices and arrangements." Telefunken Ges. für Drahtlose Telegraphie. April 8th, 1936. (Addition to 477668.) (477672.)

11444. "Device comprising a high-pressure metal-vapour discharge tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 24th, 1936. (477747.)

11682. "Wireless signalling systems for aircraft." C. Lorenz Akt.-Ges. April 30th, 1936. (477803.)

12385. "Anodes for cathode-ray tubes." Farnsworth Television, Inc. May 18th, 1936. (477874.)

12831. "Apparatus for producing harmonic frequency electrical waves from a base frequency." Standard Telephones & Cables, Ltd. May 5th, 1936. (477875.)

13711. "Electric metal rectifiers of the dry-plate type." Siemens-Schuckertwerke Akt.-Ges. May 18th, 1936. (477676.)

13966. "Containers for electric lamps, radio tubes, and the like." W. A. Ringler. May 19th, 1937. (477945.)

14297. "Electric cooking-plates." British Thomson-Houston Co., Ltd. May 22nd, 1936. (477751.)

15365. "High-frequency inductance coils." Steatit-Magnesia Akt.-Ges. February 17th, 1937. (477678.)

16360. "Televisor receiver with arrangement for projection." E. Michaelis. June 12th, 1936. (477814.)

18115. "Glands for electric cables." Siemens-Schuckertwerke Akt.-Ges. June 29th, 1936. (477879.)

18564. "Mercury-cathode discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 6th, 1936. (477816.)

18932. "Generators for saw-toothed oscillations." British Thomson-Houston Co., Ltd. July 24th, 1936. (477757.)

19934. "Electric incandescent lamps." M. Imura. July 19th, 1937. (477758.)

21202. "Electric motors." British Thomson-Houston Co., Ltd. July 31st, 1936. (477683.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 26th :—

Goblin-Teasmade. No. 581701. Class 6. Time-controlled water-heating and tea-making apparatus.—The British Vacuum Cleaner & Engineering Co., Ltd., Parsons Green Lane, Fulham, S.W.6.

Morco (lettering and design). No. 576937. Class 9. Electrical accumulators (not for medical purposes), ammeters, electric batteries and dry cells, electric cables, electric induction coils, electric lamps (philosophical), electric resistances, electric switchboards (complete), electricity meters, flashlight signalling apparatus, electrical leakage indicators, rheostats, electrical time switches, voltmeters, &c.—T. B. Morley & Co., Ltd., Liberty Chambers, Jameson Street, Hull.

Four Square (lettering and design). No. 578092. Class 8. Electric batteries (not for medical purposes).—Britannia Batteries, Ltd., Union Street, Redditch, Worcs.

Travelling X-ray Testing Laboratory

The Austrian State Railway authorities have recently put into operation a travelling X-ray testing laboratory equipped with radioscopic and radiographic instruments. The four-wheel covered railway van is equipped with two 130-kV transformers, the secondary windings of which are so arranged that they may be coupled in series, the connecting point having also an earth connection. The two transformers provide from 15 to 20 microamp. at 260 kV, which is rectified by a series of kenotron valves. Where mains supply is not available the transformers are energised by a petrol-electric set, which also furnishes the current for the filament-heating transformers of the kenotrons and the X-ray tubes. For the examination of the microstructure of metals the transformers are connected in parallel and regulated to give 40 microamp. at 70 kV, which enables the duration of the exposures to be reduced to a few minutes. Bulbs kept cool by radiation and water circulation are used for the microstructure examinations, especially in the case of tests of material some distance away from the travelling laboratory. The X-ray apparatus is arranged in the interior of the van, the walls of which are covered with layers of lead 5 mm. in thickness, a glass inspection window being provided.

National Certificates and Diplomas

The national certificates and diplomas in electrical engineering awarded in England and Wales by the Institution of Electrical Engineers in conjunction with the Board of Education for the last three years totalled 1,258, 1,197 and 1,328. The total numbers of failures were 873, 817 and 906. The 1937 awards were 816 ordinary and 407 higher certificates (62 endorsements) and 27 ordinary and 16 higher diplomas.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—School, Gunnersbury Lane (£48,262); Higgs & Hill, Ltd. Extensions to premises, for Western Margarine, Ltd., Westfields Road; Sir E. Cooper, architect, 4, Verulam Buildings, Grays Inn, London, W.C.1.

Arnside.—Convalescent home (£20,000), for the Committee of the Manchester and Salford Hospital Saturday and Convalescent Homes Fund, 12a, Piccadilly, Manchester; H. S. Fairhurst and Son, architect, Chancery Chambers, 55, Brown Street, Manchester.

Barking.—Houses (80), Westrow Drive; Leftley Bros., Ltd. Flats (43), London Road (£28,800); A. McClelland & Co., Ltd.

Basford (NOTTINGHAM).—Houses (48), Greasley parish; J. J. Ellis, housing architect, Rock House, Stockhill Lane, Basford.

Bideford.—Cinema (£20,000), Kingsley Road, for Bideford Entertainments, Ltd.; Fassnidge, Sons & Norris, Ltd., contractors, High Street, Uxbridge.

Birmingham.—Factory, Berkeley Road East, for J. Lucas, Ltd. Eight shops and houses, Swinford Road and Court Oak Road; R. P. Garner. School, Ridpool Road (£38,350), for the E.C. Bus depot, Quinton Road, and enlargement of infirmary (£95,000); city engineer.

Boldon (CO. DURHAM).—Houses (124), three sites; N. Hindmarsh, U.D.C. surveyor.

Carlisle.—Houses (200), Petteril Bank estate; city engineer.

Chadderton.—Houses (114), Higher House Farm site, near Thompson Lane (£48,310); U.D.C. surveyor.

Chatham.—Houses (166); borough surveyor.

Cheshire.—Schools, Green Lane, Altrincham, and Knutsford, for the County E.C.; F. Anstead Browne, county architect, The Castle, Chester.

Cirencester.—Houses (20), South Cerney; Fletcher & Wilkes, builders, Cirencester.

Clowne.—Cinema, North Road, for Multiple Cinemas, Co., Ltd.,

Congleton.—Houses (94), Bromley Farm estate; borough surveyor.

Coventry.—School, Whoberley (£18,538); E.C.

Cowbridge.—Houses (26), Llanharan; E. Loveluck, architect. 12, Dunraven Place, Bridgend.

Darton.—Houses (38), Kexborough; chief sanitary inspector, Council Offices, Darton, near Barnsley. Houses (32), New Road, Stain Cross; Royston Builders, Ltd., North Road, Royston.

Doncaster.—Houses (36), three sites, for Isle of Axholme R.D.C.; surveyor to the R.D.C., Council Offices, Epworth.

Dover.—Houses (32), between Old Park Hill and Brookfield Avenue; E. Greenhalgh, builder, Dover.

Dudley.—Extensions to Express & Star Offices, Wolverhampton Street; Midland News Association, Ltd.

Dumbarton.—Houses (56), Gruggie's Burn and Silverton Avenue, Newtown; Dumbarton Building Society.

Edgeley (STOCKPORT).—Reconstruction of Alexandra Cinema, Castle Street, for Jefton Entertainments, Ltd.; W. & S. Bradley, architects, 20, Brazennose Street, Manchester.

Essex.—Alterations and additions to West Mersea Council school; county architect.

Gateshead-on-Tyne.—Houses in flats, Lobley Hill; Lisle & Sons, builders, Whitley Bay.

Glasgow.—Munitions factory, Bishopton; A. A. Stuart & Sons, Ltd., builders, Carmyle.

Great Bookham.—Houses (100), for Gillett, Stephens & Co., Ltd.; A. G. Stedman, architect, Verulam Buildings, Gray's Inn, London, W.C.1.

Greenford.—School, Ruislip Road (£46,495); Higgs & Hill, Ltd.

Greenock.—Block of buildings, Smithston Mental Institution (£25,000); medical superintendent.

Hayes.—School, Cranford Park estate (£35,371), and enlargement of Yeading school (£20,090); W. S. Try.

Hertfordshire.—School, Welwyn Garden City, for the C.C.; clerk of the County Council, Education Office, Hertford.

High Wycombe.—Health centre, Dyke Meadow (£9,700); George Biggs & Sons, contractors, Great Kingshill.

Huntingdonshire.—School, Huntingdon (£35,000); J. Cracknell, Ltd., Huntly Grove, Peterborough

Inverness.—R.C. school (£10,500), for C.C.; Reid & Forbes, architects, Edinburgh. Extensions to municipal aerodrome, Longman (£15,000); burgh surveyor.

Inverness-shire.—Reconstruction of Beaufort Castle (£50,000) after fire, for Lord Lovat; R. Fairlie, architect, Edinburgh.

Ireland (NENAGH).—Factory, for T. D. Briscoe & Manders, Dublin.

Irvine (AYRSHIRE).—Extension to factory (£3,000), for Nobels Explosives Co., Ltd.; manager.

Keighley.—School, Guard House estate; Evans & Crossley, architects, Liverpool.

Kent.—Extensions to Sessions House, Maidstone (£32,075); county architect.

Kidderminster.—School, Habberley Road; Pritchard, Godwin & Clist, architects, Bank Buildings.

Kingston-on-Thames.—Houses, Dickerage Lane site (£15,290); W. Ward Perry & Son, contractors, Hounslow.

Kirkintilloch.—Houses (128), Greens Farm estate; burgh surveyor.

Lancashire.—Library, Kirkham (£2,450), and nurses' home at Institution, Whiston (£39,150), for the County Council. Schools, Fleetwood, Great Harwood, Newton-in-Makerfield, Whiston, and enlargements of Grammar school, Clitheroe. Technical school, Lytham St. Anne's, and extensions to Grammar schools at Bacup and Ormskirk, for the C.C.

Leeds.—Houses, Belle Isle estate; Tarran Industries, Ltd. (510), and W. Thompson & Sons (96); also school; city architect.

Lincoln.—Dwellings (178), (£66,243); Walters & Westley, contractors, Sheffield.

Liverpool.—School, Stanley Park (£52,882), for the E.C.

Loftus.—Houses (70), Deepdale estate; E. Hollis, U.D.C. surveyor, The Council House, Loftus, Saltburn.

London.—(CAMBERWELL).—Flats (£15,000), Albany Road; L.C.C. architect, County Hall, Westminster Bridge, S.E.1. School, Rolls Road (£25,970); Rowley Bros., Ltd., Tower Works, Dunloe Avenue, N.17. (CHELSEA).—Extensions and improvements, Chelsea Hospital for Women (£30,000); Governors. (DALSTON).—Reconstruction of County Secondary school (£46,067); A. E. Symes, Ltd., 1a, Carpenter's Road, E.15. (HAMMERSMITH).—Seven shops and flats, Old Oak Road; Marshall & Tweedy, 9, New Cavendish Street, W.1. School, White City site (£40,265); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (POPLAR).—Tenements (68), Dock Cottage area (£32,333); A. T. Rowley, Ltd. (LEWISHAM).—Houses (116) and flats, Winsford Park estate; Homesteads, Ltd., 27, Essex Street, W.C.2.

Manchester. — Houses, Withington and Wythenshawe (£228,275); city architect.

Mansfield.—Fire station and men's quarters; R. Moore & Son.

Mill Hill (MIDDLESEX).—Flats (48), Wole Road, for Saville Estates, Ltd.; Housales, Ltd.

Mirfield.—Houses (24), Sunnybank Road; F. Flowitt, Pontefract.

Newcastle-on-Tyne.—Six-storey building, Orchard Street, for Federated Clubs, Ltd.; H. Kindred, builder, Rosevale Sunniside, Wickham, Co. Durham.

Northampton.—Houses (31), near London Road; R. H. Hewins. Six shops and houses, near Windsor Crescent; A. & F. Gale, Ltd. Extensions to Manfield Orthopædic Hospital, Kettering Road; Governors.

Northamptonshire.—Extensions to Rounds Council school; county architect, County Hall, Northampton.

North Shields.—Two blocks of three-storey houses, Chirton Green, for E. Scorer; J. R. Wallace, architect, 20, Northumberland Square, North Shields. Factory, Norham Terrace, for North-Eastern Trading Estates, Ltd.; Hays & Gray, architects, Camden Street.

Northumberland.—Schools, Bedlington, Bellingham, Haydon Bridge, Humshaugh, Wark, Newburn, Ponteland, and Rothbury, for the E.C.; county architect, County Hall, Newcastle-on-Tyne.

Nuneaton.—School, Higham Lane (£52,238), for the E.C.

Oakengates.—Houses (44), Trench site; M. S. Lee, engineer and surveyor to the Council, Council Chambers.

Ongar.—Houses (24), several sites; R.D.C. surveyor.

Penzance.—Houses (316), Treneere estate housing scheme; town clerk, Municipal Buildings.

Pontefract.—Extensions to premises and stores for Ringtons, Ltd.; Brown & Lodge, contractors, Southgate.

Ramsbottom.—Houses (224), Bank Lane estate; A. Plunkett, U.D.C., surveyor, Council Offices.

Rawtenstall.—Motor showrooms, Haslingden Road; B. Barnes & Sons, Ltd.

Royston (BARNSLEY).—Houses (29), Hollycroft, High Street; Dyson, Cawthorne & Coles, architects, 25, Regent Street, Barnsley.

Saltburn-by-Sea.—Modernisation of the Zetland Hotel (£10,000), for the L.N.E.R.; R. T. Snaith & Son, Ltd., Darlington.

Sheffield.—Building, Rockingham Street, for the Royal Sheffield Institution for the Blind. Houses (44), Manor Laithes Road; M. Bonnor. Totalisator buildings, St. John's Road; Hyde Park Greyhounds, Ltd.

Shipley.—Premises for Salt High school, Coach Road; Mr. Wormald, architect.

Smethwick.—Houses (64), £31,000, Thimblemill Road; Housing, Ltd., builders, Blackheath.

Southport.—Houses (24); borough surveyor, Town Hall.

South Shields.—Extensions to Town Hall (£19,000); borough engineer.

Standish-with-Langtree.—Houses (50), Wigan Lower Road; J. E. Owen, builder, Preston Road.

Stockport.—Modernisation of Hippodrome Picture Theatre, St. Petersgate; Regal Cinemas (Lincoln), Ltd. Extension to Parkside Mental Hospital (£200,000); Thomas Davies & Sons, contractors, Turncroft Lane.

Stoke-on-Trent.—Cinema, High Street, Fenton, near Stoke-on-Trent, for Shemilt & Grocott; A. Glyn Sherwin, architect. Rectory Chambers, Newcastle-under-Lyme.

Surrey.—Homes, Institution site, Farnham (£34,000); county architect.

Sutton Coldfield.—Houses (16), Chester Road; A. Francis. Houses (14), Common Road; T. Morgan & Sons. Houses (82), George Frederick Road; W. M. Price.

Tottenham.—Library, Cissbury Road (£10,900); borough engineer. Six shops and stores, High Road; Burley Property Investment Co., Ltd. Extensions to factory, Garman Road; Vernier Manufacturing Co., Ltd., Park Factory estate, Northumberland Park, N.17. Extensions to Derby works, Vale Road; Power Flexible Tubing Co., Vale Road, London, N.4.

Tynemouth.—Houses (12), Chirton Green; C. P. Sherwin. Houses (36), Verne Road, Balkwell; W. Carruthers. Factory, Norman Terrace; North East Trading Estates, Ltd.

Uddingston.—Houses (100), Langlands, Kyle Park; J. Ritchie & Sons, contractors, Station Place, Cambuslang.

Warrington.—Houses (160), Long Lane estate; Clough & Gaskell, Ltd.

Weymouth.—Shops and offices, site of Market House (£20,000); borough surveyor. Municipal offices, Radipole estate; borough engineer.

Willesden.—Enlargement of Technical college (£7,952); W. H. Gaze & Sons, Ltd.